SUMMARY OF U.S. OBSERVER SAMPLING OF FOREIGN AND JOINT VENTURE FISHERIES IN THE NORTHEAST PACIFIC OCEAN AND EASTERN BERING SEA, 1986

by

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ABSTRACT

This report summarizes the 1986 foreign and joint venture groundfish activities in the eastern Bering Sea, the Gulf of Alaska, and off the Washington-Oregon-California coast. Tables contained herein provide estimates of the foreign and joint venture groundfish catches. Estimates of the rockfish and flatfish catches are shown by species group and also by species. Estimates are made of the catches and average weights of Pacific salmon (Oncorhynchus spp.), Pacific halibut (Hippoglossus stenolepis), snow crab (Chionoecetes spp.), and king crab (Lithodes and Paralithodes spp.).

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INTRODUCTION

The year 1986 was the 10th year that foreign and joint venture fisheries operated under the Magnuson Fishery Conservation and Management Act (MFCMA) of 1976 which requires foreign vessels to accept observers. In 1986, the Northwest and Alaska Fisheries Center sent 322 U.S. fisheries observers to sample aboard Japanese, Polish, Republic of Korea (ROK), Peoples Republic of China (PRC), and Soviet vessels involved with either foreign fisheries or as joint venture processing ships in fisheries conducted with U.S. fishermen. (See Table 1 for a description of the various vessel types and a listing of vessel class abbreviations which are used in tables in this paper.) The MFCMA requires all foreign vessels to have an observer aboard during fishing operations (except in approved situations). In 1986, overall observer coverage of the total number of foreign vessel days on grounds (100 x observer days/foreign vessel days) was 94%. This represented 18,158 days in which observers actually sampled aboard foreign vessels which spent a total of 19,306 vessel days on the fishing grounds in the Bering Sea, Gulf of Alaska, and off the Washington, Oregon, and California coasts.

The purposes of placing observers on foreign and joint venture fishing vessels within the U.S. 200-mile exclusive economic zone (EEZ) were 1) to collect data that could be used to estimate the foreign and joint venture commercial catches; 2). to determine the incidental catch of species whose retention is prohibited by U.S. regulations; 3) to provide information needed to assess the biological status of the various stocks of fish; and 4) to report on suspected violations of U.S. fishing regulations.

The information obtained by observers included the location, duration, average depth, and catch weight of each trawl haul or longline set made while the observer was aboard. Observers on motherships recorded the noon (Greenwich mean time) position of the processing ship and the tonnage caught by the type of catcher boat. In addition, each observer sampled several hauls or portions of the longline set each day to determine species composition by weight, the incidence in the catch of those species whose retention is prohibited by U.S. regulations, and the age and length composition of designated species in the catch. Upon return to Seattle, observers also submitted reports of any suspected violations of U.S. regulations as well as descriptions of fishing strategy and sampling methods used.

OBSERVER SAMPLING PROCEDURES

The sampling procedures used by observers in 1986 have been described by Nelson et al. (1981) and French et al. (1981). While on the vessel, the observer determined the species composition of the catch by taking representative basket samples of various trawl hauls or portions of a longline set. Individuals of each species in the samples were then counted and weighed. If the catch on a stern trawler or joint venture processing ship was composed of a high percentage of one species, the observer often determined the composition of the entire haul by separating, counting, and weighing all nontarget species. The weight of the target species was calculated by subtracting the weight of the other species from the total haul weight. The numbers of the target species were obtained by dividing the total

weight of the species by the average weight per fish determined from a sample of the catch. For those species for which additional biological information was desired, length frequencies were taken from random samples, and otoliths or scales were taken from subsamples stratified by length and sex. Observers monitored the catch being emptied from fish holding bins via conveyor belts, watched the emptying of nets or the landing of the longline catch, and recorded the number of salmon (Oncorhynchus spp.), Pacific halibut (Hippoglossus stenolepis), snow (Tanner) crab (Chionoecetes spp.), and king crab (Paralithodes and Lithodes spp.) per unit weight of catch. These species have been designated as prohibited species and as such, U.S. regulations prohibit the retention of the incidental catch of these species. Observers also collected data on the sightings and incidental catch of marine mammals, the design and dimensions of fishing gear, and methods of fish processing, and at times they did other special studies.

METHODS OF CALCULATION

Estimates of Foreign and U.S. Joint Venture Catches

Estimates of the foreign catches were based on observer and foreign reported data using the method previously described by Nelson et al. (1981). In this technique, the average daily catch rates of each species by vessel class (obtained by observers for the vessels sampled) for a particular statistical reporting area were applied to the total number of vessel days on the grounds in that area. Refer to the first figure in each section for the boundaries and designations of the statistical reporting areas of each region. Data on fleet vessel days on the grounds were obtained from the foreign vessel check-in and check-out summaries which are required by U.S. regulations and are verified by Coast Guard surveillance flights and ship patrols. In a very few instances during 1986, observer coverage of a given week-area-vessel class element was less than 20% (week is defined to be a calendar week). In these cases, it was thought that estimates based solely on the existing observer data might not be representative of the total foreign fishing in that element. In order to provide a "best estimate," the U.S. estimates were used when observer coverage of a week-area-vessel class element was at least 20% and when the U.S. estimate of the catch differed by more than 10% from the foreign-reported catch for that element. Catches reported by foreign vessels were used for those elements which did not meet both of the above criteria.

It was not feasible to estimate the catch of U.S. joint ventures in exactly the same way as the foreign fisheries, due to unequal and constantly fluctuating numbers of catcher boats delivering fish to the processing vessels. When observers were present on 20% or more of the processing ships in a particular element, the percent species composition of the catch by weight, as determined by observer sampling, was applied to the sum of the total catch weights reported by the processing vessels. If there was less than 20% observer coverage of the joint venture processing fleet for that week-area, or when the estimates at the 20% or greater coverage level differed by less than l0%, the foreign reported catch by species was used.

Estimates of Incidental Catches and Average Weights of Pacific Salmon, Pacific Halibut, Snow (Tanner) Crab, and King Crab

The mean incidence (number of individuals caught per metric ton (t) of groundfish catch), and the total incidental catch (numbers and tonnage) of Pacific salmon, Pacific halibut, Tanner crab, and king crab in the 1986 foreign and joint venture groundfish fisheries were estimated from U.S. observer data. The incidental catches, in numbers, of these species were estimated by multiplying the average monthly incidence rates for each nation, area, and vessel class by the estimated monthly groundfish catches for those same nations, areas, and vessel classes. Incidental catch by weight was calculated by multiplying the estimated numbers of fish or crab caught each month by the average weight per individual in kilograms determined from observer samples for that same data element. In instances where monthly incidence data were not available for a particular nation, area, or vessel class, mean quarterly or annual rates from those same areas or vessel classes were applied to monthly groundfish catches. In cases where no sampling was conducted by observers during the year, the incidental catch was estimated by using data collected from another nation, vessel class, or area which was judged to have a similar fishing operation.

Estimates of Rockfish and Flatfish Catch by Species

Estimates of the foreign and joint venture catches of rockfish and flatfish by species were made by applying the mean annual species composition (percentage by weight) computed from samples collected by U.S. observers to the total rockfish and flatfish catch. Specific catch allocations were set for yellowfin sole (Limanda aspera) and Greenland turbot (Reinhardtius hippoglossoides) in the Bering Sea and Pacific ocean perch (Sebastes alutus) off the Washington-Oregon-California coast; therefore, the best estimates of catch were used for those species in those regions. In cases where no species composition data were collected, a judgment was made as to whether data from another nation, area, or vessel class would best reflect the expected composition of the catch of flatfish or rockfish for the data element in question. All observers were trained in species identification and instructed in the use of fish identification keys but errors in the identification of some species could have been made.

Table 1 .--Definition of foreign vessel classes used by U.S. observer program in the Bering Sea/Aleutian Islands and North Pacific groundfish fishery.

Vessel class	Abbreviation	Definition
Mothership - Surimi	SMS	Mothership fleets with capacity to produce surimi (a minced fish product), frozen products, and meal.
Mothership - Freezer	FMS	Mothership fleets with capacity to produce frozen products or meal.
Mothership - Freezer joint venture	FJV	Mothership fleets, producing primarily frozen products, where the catcher boat fleet is composed of U.S. trawlers and the mothership is of foreign registry. Fish caught are defined as U.S. landings.
Mothership - Surimi joint venture	SJV	Mothership fleets, producing primarily surimi products, where the catcher boat fleet is composed of U.S. trawlers and the mothership is of foreign registry. Fish caught are defined as U.S. landings.
Small stern trawler	SST	Independent stern trawlers less than 1,500 gross registered tons (GRT).
Large freezer trawler	LFT	Independent stern trawler 1,500 GRT or greater, with capacity to produce frozen products or meal.
Large surimi trawler	LST	Independent stern trawler 1,500 GRT or greater, with capacity to produce surimi, frozen products, and meal.
Longliner	LL	Independent vessels fishing with baited longline gear.

SUMMARY OF OBSERVER SAMPLING FOR THE BERING SEA/ALEUTIAN ISLANDS REGION

Observer Coverage of Fishing Fleets

During 1986, foreign vessels from Japan, Poland, the Republic of Korea (ROK), and the People's Republic of China (PRC) spent 5,015 vessel days in the U.S. 200-mile EEZ in the Bering Sea/Aleutian Islands region (Fig. 1) fishing on foreign quotas (Table 2). This level of effort was less than half (40.3%) that used in 1985 (Berger et al. 1987). United States fisheries observers spent 4,615 days sampling aboard these foreign vessels resulting in an observer coverage (100 x number of observer days/number of foreign vessel days) of 92.0%. The comparative level of observer coverage in 1985 was 89.3% (Berger et al., 1987).

While foreign effort devoted to fishing on foreign quotas decreased in 1986, the effort of foreign vessels participating in joint ventures with U.S. catcher vessels increased 33%. Foreign vessels spent 9,851 days in joint venture fishing operations. These joint ventures were conducted between U.S. vessels and processing vessels from the U.S.S.R., Japan, Poland, the ROK, and the PRC. The 9,283 days spent by observers aboard the foreign processing vessels in joint venture fisheries provided an observer coverage of 94.2%, an increase of 8.4% from the 85.8% coverage obtained in 1985 (Berger et al. 1987).

A total of 13,898 of the 14,866 vessel days (foreign and joint venture fisheries combined) were sampled by observers in 1986, making an overall percent coverage of 93.5%. This level of coverage was 5.5% greater than the percent observer coverage of the Bering Sea fleets achieved in 1985.

Estimates of Foreign and U.S. Joint Venture Catches

The estimated foreign catch of groundfish in 1986 was approximately 476,000 t (Table 3). Walleye pollock (Theragra chalcogramma) made up the dominant portion of the total catch (74.1%). The combined catches of the four categories of flatfish--yellowfin sole, arrowtooth flounder (Atheresthes SPP.), Greenland turbot, and other flatfishes--accounted for 16.4% of the catches, and Pacific cod (Gadus macrocephalus) made up 8.4%. As in previous years, Japanese vessels landed the largest portion of the catch, 77.7%; ships from the ROK took 20.5%; Polish vessels caught 1.4%; and ships from the PRC landed 0.4%.

United States vessels delivered over 1.160 million t of groundfish to foreign processing vessels in the 1986 joint venture fisheries. Walleye pollock (72.0%), yellowfin sole (13.0%), Pacific cod (5.5%), other flatfishes (5.3%), and Atka mackerel (Pleurogrammus monopterygius, 2.8%) were the five major species groups targeted on in the joint venture operations.

Table 4 presents a summary of the foreign and joint venture catches by species for the years 1977 to 1986. The 1986 total foreign catch of about 0.476 million t represents a 54.0% decrease from the 1985 estimated catch of 1.035 million t. The U.S. joint venture landings continued the steady increase in size they have experienced since the beginning of that fishery in 1980. The

1986 joint venture catch estimate of 1.160 million t represents an increase of 81% over the 1985 figure of 0.639 million t. The increased catch by the joint venture fisheries was primarily in the catch of pollock, but almost all of the other species groups were also caught in larger amounts. The sole exception was Atka mackerel (decreasing 16% to 32,000 t). The decreased catch of Atka mackerel was due to a decrease in its optimum yield and the resulting decrease in its 1986 joint venture allocation.

Incidence and Incidental Catch of Prohibited Species

Incidence rates of salmon, halibut, Tanner crab, and king crab for all the statistical reporting areas were calculated as described in the introduction section. In addition, incidence rates were also calculated for the triangular area labelled "outside EEZ" (exclusive economic zone) in Figure 1. In recent years, pelagic trawling for pollock has occurred in this area, and at times observers have been aboard and sampled the catches. As the area is outside U.S. jurisdiction, no data are available on vessel days on the grounds, thus total catch estimates for this area cannot be calculated. Incidental catch rate data for this region are included in the tables for informational purposes only.

In 1986, the Secretary of Commerce imposed emergency regulations on fisheries conducted for yellowfin sole and other flatfishes in order to control the incidental catches of red king crab (Paralithodes camtschatica) and Chionoecetes bairdi Tanner crab which are taken in these fisheries and to help protect the stocks of these two species of crab from further decline. The regulations imposed the following restrictions on the groundfish fishery:

a) Prohibited all foreign and joint venture trawling in the area between 160 and 162OW. long. and south of 58ºN. lat. Under controlled circumstances, a domestic trawl fishery for Pacific cod was allowed in a limited section of the closed area;

b) Created an area designated as Zone 1 (Fig. 2) in which joint venture and domestic fisheries for yellowfin sole and other flatfishes could not catch more than 135,000 red king crab or 80,000 C. bairdi Tanner crab. If either quota was reached, the area would be closed to these fisheries and if the closure was due to reaching the red king crab limit, then the area would be closed to any foreign fishing for yellowfin sole and other flatfish for the remainder of the year;

c) Created an area designated as Zone 2 (Fig. 2) in which the joint venture and domestic yellowfin sole and other flatfish fisheries could not catch more than 326,000 C. bairdi Tanner crab. If the quota was reached, the area would be closed to these fisheries for the remainder of the year;

d) Created an area designated as Zone 3 (Fig. 2) in which fisheries for yellowfin sole and other flatfishes could be conducted without any limitations placed on the incidental catches of red king crab or C. bairdi Tanner crab;

e) In the combined area of Zone 1 and Zone 2, a limit of 64,000 C. bairdi Tanner crab was placed on foreign fisheries for yellowfin sole and other

flatfishes. If the limit was reached, Zones 1 and 2 would be closed to all foreign fishing for yellowfin sole and other flatfishes for the remainder of the year.

On 18 June 1986, Zone 1 was closed to any further fishing for yellowfin sole and other flatfish due to the incidental catch limit of 80,000 C. bairdi Tanner crab being exceeded by the joint venture fishery. As a result of the interest in the impact of the emergency regulations on the yellowfin sole/other flatfish fishery in 1986, the estimated incidental catches of king crab, Tanner crab, and halibut taken by the yellowfin sole/other flatfish fishery in each of the three zones have been included in this report.

Pacific Salmon

The incidence rates and average weights of salmon taken in the catches sampled by observers are shown in Table 5. Incidence rates were very low in 1986, exceeding 0.1 salmon/t only five times. The PRC large freezer trawlers fishing in March caught 1.000 salmon/t and 0.196 salmon/t in Areas II and IV, respectively. In December, they caught 0.179 salmon/t in Area I. In November, Polish large freezer trawlers targeting on pollock caught 0.100 salmon/t in Area I. United States joint venture operations with the ROK caught 0.376 salmon/t in Area I in August. The highest annual incidence rate (0.822 salmon/t) occurred on the PRC large freezer trawlers in Area II. All other nations and vessel classes had annual incidence rates less than 0.050 salmon/t.

The incidence of salmon by vessel class, quarter, and l/2° latitude by l° longitude statistical area is illustrated in Figures 3-6. Small stern trawlers had only one occurrence of incidence rates greater than 0.5 salmon/t (55°30'EJ lat., 170°W long. in the first quarter). Large surimi trawlers had one occurrence of incidence rates greater than one salmon/t (in the fourth quarter at 56°00'N lat., 171°W long.), and large freezer trawlers had one occurrence of incidence rates greater than 0.5 salmon/t (in the first quarter at 54°30'N lat., 172°W long.). Aside from these, there were no other occurrences of salmon incidence rates which exceeded 0.5 salmon/t in foreign catches made by small trawlers (Fig. 31, large surimi trawlers (Fig. 41, or large freezer trawlers (Fig. 5). Salmon incidence rates were also low aboard joint venture vessels (Fig. 61, with only one occurrence of rates greater than one salmon/t (in the third quarter at 55°00'N lat., 165°W long.).

Table 6 presents the estimated incidental catches of salmon by nation, area, and vessel class. In 1986, foreign vessels caught 1,643 salmon incidental to the groundfish fishery; a substantial reduction from 1985's estimated catch of 10,003 salmon. The overall reduction in the salmon catch was due to the decreased salmon catch rates by Japanese surimi trawlers and the reduction in groundfish catch by all nations. In 1986, the estimated incidental catch of salmon in the joint venture fisheries increased from that of 1985 by 86% to 19,340 fish. The incidental catch rate for the U.S.-Japan joint venture operations in Area I decreased 50% in 1986, but a tripling of the catch rate for the U.S.-ROK joint venture operations in Area I led to the increase in the estimated salmon catch.

The incidental catch of salmon in the foreign fishery has declined steadily since 1980 (Table 7). The 1986 catch of 1,643 fish or 5 t is the lowest estimated catch for all years from 1977 through 1986. The 1986 joint venture catch of 19,340 fish was greater than that of 1985, but was less than those catches taken in 1983 and 1984. The total salmon interception (foreign and joint venture fisheries combined) of 20,983 fish was the second lowest number caught since the implementation of the MFCMA in 1977.

The species composition, sex composition, average weight, and average length of the salmon in the incidental catch are given in Table 8. Four species of salmon were represented in the catches taken on foreign vessels. Chinook salmon (Oncorhynchus tshawytscha) composed 59.55% of the foreign incidental catch, chum salmon (0. keta) made up 37.88, 2.2% were coho salmon (O. kisutch), and sockeye salmon (O. nerka) accounted for 0.5%. Five salmon species were observed in the joint-venture catches: chum salmon, 71.4%; chinook salmon, 25.0%; coho salmon, 0.2%; sockeye salmon, 3.3%; and pink salmon (0. gorbuscha), 0.05%.

Pacific Halibut

Table 9 lists the incidence rates and average weights of halibut in foreignand joint venture catches by nation, vessel class, area, and month. In the foreign fishery, the highest annual average incidence rate was observed in Area II on Japanese longline vessels fishing for Pacific cod in waters shallower than 500 m (6.324 halibut/t). All other annual average incidence rates greater than 1.0 halibut/t were observed in Area I (Japanese freezer mothership,, 1.010 halibut/t; Japanese small trawler, 1.041 halibut/t; Japanese large freezer trawler, 1.799 halibut/t; PRC large freezer trawler, 1.977 halibut/t). In the joint venture fisheries, the only observed annual incidence rate of halibut greater than 1.0 fish/t occurred in the U.S.-U.S.S.R. joint venture conducted in Area I (1.761 halibut/t).

Figures 7-10 illustrate the incidence of halibut by vessel type, quarter, and l/2° latitude by l° longitude areas. High incidence rates of 10 halibut/t or greater were observed on small stern trawlers (Fig. 7) in the second quarter (58°00'N lat., 163°W long., 60°30'N lat., 178°W long.), and the fourth quarter (58°30'N lat., 166°W long.). Incidental catch rates of 1.0 halibut/t to 10.0 halibut/t were commonly observed on small stern trawlers throughout the year along the continental slope and on the continental shelf. Incidental catch rates of halibut on large surimi trawlers were generally less than 1.0 halibut/t. Incidental catch rates greater than 10 halibut/t were found on large freezer trawlers (Fig. 8) in the first quarter (56°30'N lat., 167°-168°W long.) and in the second quarter (57°30'N lat., 166°W long.). Incidence rates exceeding 5.0 halibut/t were commonly observed on longline vessels throughout the year (Fig. 9). The incidence of halibut frequently exceeded 10 halibut/t during the fourth quarter on longline vessels fishing along the continental slope between 170° and 176°W longitude. In the joint venture fisheries (Fig. l0), halibut incidence rates of 10 halibut/t or greater were observed in the first quarter (54°OO'N lat., 165°-166°W long.), in the second quarter (52°00'N lat., 171 °W long.), and in the third 'quarter (58°30'N lat., 162°-163°W long., and at 59°OO'N lat., 166°W long.).

The estimated halibut catch in the 1986 foreign fishery (296,400 fish) was 39% lower than the amount caught in 1985 (Tables 10 and 11). Decreases in the estimated catch of halibut occurred for almost every nation and vessel class in the foreign fishery. The only exception was for Japanese freezer motherships, where increased catch rates resulted in higher catches of halibut. Decreased catches of groundfish were responsible for the decreased catches of halibut by the trawl fleets, and generally lower incidence rates were responsible for the decreased catches of halibut by the longliners.

Most of the estimated catches of halibut in the joint venture fisheries were taken in operations targeting on yellowfin sole and other flatfish, Pacific cod, and pollock in Area I. Joint venture operations in Area I between the United States and the ROK caught an estimated 145,100 halibut in 1986 (a 223% increase over 1985). In this joint venture, almost 126,000 halibut were landed in tows predominating in the catch of pollock and Pacific cod, and only 19,100 halibut were landed in tows targeting on yellowfin sole/other flatfish. Incidence rates in both fisheries were slightly lower in 1986, but almost twice as many flatfish were caught in 1986 and the catch of pollock and Pacific cod increased threefold. These increased groundfish catches accounted for the increased number of halibut caught. The U.S.-U.S.S.R. Area I joint venture took an estimated incidental catch of about 300,000 halibut in 1986, which is a 16.0% increase in catch from the estimated 259,100 landed in 1985. In the U.S.-U.S.S.R. joint venture over 201,300 halibut were caught in operations targeting on yellowfin sole/other flatfish and almost 99,350 halibut were caught in tows landing pollock and Pacific cod. Incidence rates decreased overall in the U.S.-U.S.S.R. flatfish operations in 1986, but increased incidence rates of halibut in the pollock and Pacific cod fishery and increased groundfish catches in the yellowfin sole/other flatfish and the pollock and Pacific cod operations resulted in the 16% increase in halibut landings. The incidental catches of halibut in the yellowfin sole/other flatfish joint venture fishery in the three zones established by emergency regulation in 1986 were an estimated 95,782 halibut in Zone 1, 64,691 halibut in Zone 2, and 114,659 halibut in Zone 3.

The total estimated catch of halibut taken incidentally in the foreign and joint venture fisheries decreased 5%, from about 933,000 halibut in 1985 to about 890,000 in 1986 (Table 11). The estimated catch of halibut in the foreign fisheries decreased about 39% (from about 485,300 in 1985 to 296,400 in 1986), but the estimated halibut catch in the joint venture fisheries increased almost 33% (from approximately 447,400 in 1985 to 593,600 in 1986). Though the total number of halibut taken in 1986 was less than that of 1985, the incidental catch in terms of weight increased 3% over that of 1985. The overall average size of halibut was 69.2 cm (4.4 kg) in the foreign directed trawl fisheries, 67.0 cm (3.8 kg) in the longline fishery, and 57.9 cm (2.9 kg) in the joint venture fisheries.

Snow (Tanner) Crab

The incidence and average weights of Tanner crab observed in the foreign and joint venture fisheries in 1986 are summarized in Table 12 by nation, vessel class, month, and area. The highest annual incidence rates in the foreign fishery were observed in catches landed on Japanese small trawlers in Area I (28.281 crab/t) and Area II (13.926 crab/t); on Japanese large freezer

trawlers in Area I (5.266 crab/t) and Area II (14.232 crab/t in a small fishery); on PRC large freezer trawlers in Area I (19.358 crab/t); and on ROK large freezer trawlers in Area I (5.248 crab/t). The highest average rates in the joint venture fisheries were by the U.S.-U.S.S.R. operations in Areas I and II (19.108 crab/t and 240.299 crab/t, respectively) and by U.S.-Japan fisheries operating in Area I(6.552 crab/t).

High rates of incidence of Tanner crab (10.0 crab/t or greater) were observed throughout 1986 in catches made by small stern trawlers along the continental slope (54°00' to 59°30'N lat. by 165° to 178°W long.) (Fig. 11). On large freezer trawlers (Fig. 12), Tanner crab incidence rates greater than 25 crab/t were found year-round between 56°30' and 58°00'N latitude by 159°-170°W. Longline vessels (Fig. 13) had four occurrences of greater than 10 crab/t in the first quarter (56°30'-57°30'N lat., 170°-171°W long.), and one occurrence of greater than 25 crab/t in the fourth quarter (57°30'N lat., 171°W long.). Incidence rates of Tanner crab greater than 10 crab/t were common in the joint venture fishery during the second, third, and fourth quarters (Fig. 14). Incidence rates exceeding 25 crab/t in the joint venture fishery were seen occasionally in the third quarter and the fourth quarter, but occurred frequently in the second quarter (55°30'-59°00'N lat., 162°-170°W long).

The estimated incidental catch of 1,652,742 Tanner crab in the 1986 foreign groundfish fishery was 6% lower than that taken in 1985 (Tables 13 and 14). Since the overall catch of groundfish taken by foreign vessels in 1986 decreased 54% from that of 1985, a decrease of only 6% in the catch of Tanner crab in the foreign fishery indicates that the incidental catch rates of Tanner crab (number per ton) actually increased in the foreign fishery in 1986. Increased catch rates of Tanner crab as well as an increase in the groundfish catch by joint venture operations led to a more than fivefold increase in the incidental catch of Tanner crab by the joint venture fishery in 1986. The estimated catch of 5.543 million Tanner crab in 1986 by the joint venture fishery was the highest catch of Tanner crab taken by the joint venture fishery since its inception in 1980 (Table 14). The total incidental catch of roughly 7.2 million Tanner crab taken by both the foreign and joint venture groundfish fisheries in 1986 was the highest catch taken since 1980.

The large increase in the incidental catch of Tanner crab in the joint venture fishery resulted from the movement of the primary fishing grounds of the yellowfin sole fishery northward in response to emergency restrictions imposed on the fishery by the Secretary of Commerce to protect the stocks of red king crab (Paralithodes camtschatica) and Chionoecetes bairdi which are concentrated in the Bristol Bay region (refer to the section "Incidence and the Incidental Catch of Prohibited Species", pages 11-14 for further discussion of the emergency regulations). The northward shift of the fishery moved the fishery into areas where high abundances and thus high catches of C. opilio were encountered. In Zone 2, 3.338 million Tanner crab were caught; in Zone 3, the catch was 1.678 million Tanner crab. In these zones, C. bairdi made up 4.0% (132,300 crab) and 0.9% (15,400 crab) of the Tanner crab catch, respectively (Table 15). Chionoecetes bairdi made up 65.5% (115,300 crab) of the crab catch in Zone 1, but relatively few crab (176,100 Tanner crab) were caught here.

Table 16 gives the species composition, sex composition, average weight, and average carapace width of Tanner crab observed in the foreign and joint venture groundfish fisheries. Four species of Tanner crab were observed in the foreign directed fisheries: Chionoecetes opilio, C. bairdi, C. angulatus, and C. tanneri. Chionoecetes opilio made up the largest percentage of the incidental catch, 88.2%; C. bairdi was next in importance, composing 10.2% of the catch by number; and c. angulatus and C. tanneri made up 1.1% and 0.6%, respectively. In the joint venture fishery, C. opilio (92.08%) and C. bairdi (7.91%) together comprised almost the entire incidental Tanner crab catch. Chionoecetes angulatus (0.01%) and C. tanneri (<0.01 %) were found in small numbers. The species C. angulatus and C. tanneri are normally found in deeper water than the other two chionoecetes species, and are most often encountered in the catches of longline vessels and small stern trawlers fishing for Greenland turbot.

King Crab

The incidence of king crab was low in both the foreign and joint venture fisheries in 1986. There were no instances where the average annual incidence was 1.0 king crab/t or greater,and in only four cases did the monthly incidence exceed 1.0 king crab/t (Table 17). The highest average annual incidence rates of king crab were observed on Japanese small stern trawlers in Area II (0.533 crab/t) and in the joint venture fisheries conducted in Area I with the U.S.S.R. (0.507 crab/t) and the ROK (0.391 crab/t). The low incidence of king crab in the foreign fishery may have resulted from a combination of decreases in the size of the Greenland turbot and yellowfin sole fisheries in 1986. In past years, these fisheries have accounted for the highest proportions of the incidental catch of king crab in the foreign fishery. The low incidence of king crab in the joint venture fishery was the result of efforts by the participants in the yellowfin sole fishery to minimize the incidental catch of red king crab and the impact of emergency regulations imposed on the fishery for the purpose of protecting the stocks of red king crab and C. bairdi (see the section "Incidence and the Incidental Catch of Prohibited Species," pages 11-15, for further discussion of the emergency regulations).

Figures 15, 16, and 17 chart the observed incidence rates of king crab in catches made by small stern trawlers, large freezer trawlers, and joint venture vessels by quarter and l/2° latitude by l° longitude areas. High quarterly rates (5.0 crab/t or greater) were observed in small stern trawler catches (Fig. 15) in three locations in the second quarter (57°00'N lat., 162°W long.; 59°30'N lat., 178°W long.; 60°30'N lat., 178°W long.) and in one location in the third quarter (58°30'N lat., 178°W long.). One occurrence of greater than 10 crab/t was reported aboard large freezer trawlers (Fig. 16) in the first quarter at 56°30'N latitude, 164°W longitude. The only other catch rate greater than 5 crab/t was also in the first quarter (57°00'N lat., 159°W long.). The joint venture fisheries had incidence rates exceeding 10.0 crab/t once in the first quarter (56°30'N lat., 163°W long.) and once in the fourth quarter (57°00'N lat., 169°W long.) (Fig. 17). Incidence rates exceeding 5 crab/t occurred twice in the second quarter (57°30'13 lat., 159°W long.; 56°00'N lat., 162°W long.) and once in the fourth quarter (56°00'N lat., 163°W long.).

As a result of the low incidence of king crab in both the foreign and joint venture fisheries-in 1986, the estimated incidental catches of 14,631 crab in the foreign fishery and 260,435 crab in the joint venture fishery were substantially lower than the incidental catches taken in 1985 (Tables 18 and 19). Roughly the same tonnage of yellowfin sole and flatfish were landed in each of the three zones (Fig. 2), but the catch of red king crab differed considerably between Zone 1 and the other two zones. The joint venture. fishery targeting on yellowfin sole landed 126,864 red king crab in Zone 1 (Table 20). In Zones 2 and 3, the incidence rates of red king crab were substantially reduced and the catch of red king crab was estimated at 3,931 crab in Zone 2 and 3,983 crab in Zone 3. Overall, the total incidental catch of 275,066 king crab taken in the foreign and joint venture fisheries was the lowest catch taken since the implementation of the Magnuson Act in 1977.

In the Bristol Bay joint venture fishery, red king crab is the species of king crab that is taken incidentally, and composed nearly all (95.5%) of the king crab caught by joint venture fisheries in 1986 (Table 21). Red king crab also accounted for most (63.0%) of the incidental king crab taken by the foreign directed fishery, but golden king crab (Lithodes aequispina, 22.1%) and blue king crab (P. platypus, 14.5%) each made up a higher percentage of the king crab catch in the foreign fisheries than in the joint venture fishery. Couesi king crab (L. couesi) made up 0.5% of the foreign fishery king crab catch, but was not-seen in the joint venture landings. Other information found in Table 21 includes the sex composition, average weight, and average carapace length for the king crab observed in the foreign and joint venture fisheries.

Rockfish Catch by Species

Eighteen species of rockfish were identified by observers as appearing in foreign or joint venture catches in the Bering Sea/Aleutian Islands region during 1986 (Table 22). In Tables 22 and 23, the group "other rockfish" consists of nine species which make up a relatively minor percentage of the rockfish catch.

Approximately 36 t of rockfish were taken in the foreign fishery in 1986 and about 545 t were landed in the joint venture fishery (Table 23). The 1986 foreign rockfish catch decreased 70% from the 1985 estimated catch of 118 t, and has decreased 98% since 1983. The joint venture catch of rockfish increased 18% from a catch of 463 t in 1985, and has increased 258% since 1983.

Four species of rockfish made up the greatest portion (90.4%) of the rockfish catch taken by foreign vessels: Pacific ocean perch, rougheye rockfish (Sebastes aleutianus), northern rockfish (S. polyspinis), and dusky rockfish (S. ciliatus). Pacific ocean perch was the most frequently taken species in all three areas, and comprised 46.1% of the total rockfish catch. Rougheye rockfish comprised 21.0% of the catch, northern rockfish made up 15.4%, and dusky rockfish accounted for 7.9%.

In the joint venture fisheries, Pacific ocean perch (50.9%) and northern rockfish (43.3%) made up 94.2% of the total rockfish catch. In Area I, over

75% of the rockfish catch was identified as being Pacific ocean perch. In Areas II (85%) and IV (53%), the most commonly seen rockfish was northern rockfish.

Flatfish Catch by Species

Twenty species of flatfish were identified by observers in groundfish catches made by foreign and joint venture vessels in 1986 (Table 24). In the 1986 foreign fishery, yellowfin sole and Greenland turbot composed 82.2% of the total estimated catch of flatfish (Table 251. Yellowfin sole, which was the target species of a freezer mothership fishery and of small stern trawlers and large freezer trawlers, composed 83.3% of the estimated flatfish catch in Area I where about 64,800 t of flatfish were caught. Greenland turbot composed 48.7% and 69.3% of the flatfish catches taken in Areas II and IV, respectively. Greenland turbot was targeted on by many small stern trawlers and at times by longline vessels.

Essentially all (99.6%) of the flatfish catch taken by joint venture fisheries in 1986 was landed in Area I. Yellowfin sole and Alaska plaice (Pheuronectes quadrituberculatus) were the predominant species taken, accounting for 70.05% and 19.05% of the flatfish catch in Area I, and 69.8% and 19.1% of the flatfish catch overall. Rock sole (Lepidopsetta bilineata) was also an important component of the flatfish catch, accounting for 7.37% and 75.41% of the flatfish catch in Area I and IV, and 7.48% of the overall flatfish catch. Yellowfin sole was the target species of joint venture operations conducted in the Bristol Bay region in Area I, but Alaska plaice was an important secondary species.

Table 2.--Annual summary of observer effort, foreign and joint venture effort, and observer coverage (100 x observer days/foreign vessel days) by nation and vessel class in the Bering Sea/Aleutian Islands region, 1986.

Nation	Vessel Class	No. of observers	No. of ships observed	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage
Japan	Surimi mothership	10	3	3	265	277	95.7
	Freezer mothership	5	1	1	110	116	94.8
	Small stern trawler	71	42	42	1,424	1,497	95.1
	Large surimi trawler	10	8	8	176	220	80.0
	Large freezer trawler	3	1	1	105	110	95.5
	Longline	55	23	23	1,041	1,136	91.6
	Snailpot	4	2	2	171	176	97.2
	Total		80	80	3,292	3,532	93.2
Republic of Korea (ROK)	Small stern trawler	11	4	4	166	196	84.7
	Large freezer trawler	39	17	17	930	1,045	88.7
	Total		21	21	1,096	1,241	88.3
Poland	Large freezer trawler	8	7	7	147	155	94.8
PRC	Large freezer trawler	5	3	3	80	87	92.0
Total - Foreign fishery			111	111	4,615	5,015	92.0
U.S.-Japan	Other SJV		16	16	1,841	1,918	96.0
U.S.-Japan	Other FJV		3	3	58	72	80.6
U.S.-Japan	Yell/Flat SJV		2	2	57	57	100.0
U.S.-Japan	Yell/Flat FJV		14	14	627	661	94.9
U.S.-Japan	Total Joint Venture	70	35	35	2,583	2,708	95.4
U.S.-ROK	Other FJV		31	31	3,022	3,238	93.3
U.S.-ROK	Yell/Flat FJV		24	24	639	678	94.2
U.S.-ROK	Total Joint Venture	102	55	55	3,661	3,916	93.5
U.S.-Poland	Other FJV		9	9	223	231	96.5
U.S.-Poland	Yell/Flat FJV		1	1	7	7	100.0
U.S.-Poland	Total Joint Venture	14	10	10	230	238	96.6
U.S.-PRC	Other FJV		3	3	134	150	89.3
U.S.-PRC	Yell/Flat FJV		2	2	41	42	97.6
U.S.-PRC	Total Joint Venture	9	5	5	175	192	91.1
U.S.-U.S.S.R.	Other FJV		10	10	327	342	95.6
U.S.-U.S.S.R	Yell/Flat FJV		25	25	2,307	2,455	94.0
U.S.-U.S.S.R.	Total Joint Venture	57	35	35	2,634	2,797	94.2
Total - Joint Venture Fishery[a]			140	140	9,283	9,851	94.2
Grand Total		278[b]	196[c]	196[c]	13,898	14,866	93.5

[a] In the joint venture fisheries, only the foreign processing vessels are indicated for the number of ships and vessel days--the U.S. catcher boats are not included.

b This column does not add up because several observers sampled on more than one vessel type.

c Fifty-five vessels participated in both the directed and joint venture fisheries and were, therefore, only counted once within the total.

PRC = People's Republic of China.
SJV = Surimi joint venture
FJV = Freezer joint venture
Yell/Flat = Targetting on yellowfin sole/flatfish
Other = Targetting on roundfish

Table 3.--Estimated catches of groundfish taken by foreign and joint venture vessels in the Bering Sea and Aleutian Islands region in 1986[a].

	Foreign catches (metric tons)						U.S. Joint ventures[b]	
Species	Japan	Republic of Korea	Poland	PRC	Total	Percent	Metric tons	Percent
Squid	819	4	7	0	830	0.2	34	<0.1
Yellowfin sole	49,318	7,632	0	247	57,197	12.0	151,400	13.0
Arrowtooth[c]	2,591	861	1	10	3,463	0.7	3,375	0.3
Greenland Turbot	6,879	14	<1	0	6,893	1.4	36	<0.1
Other flatfishes	8,013	2,289	4	107	10,413	2.2	62,043	5.3
Pollock	262,423	81,632	6,831	1,443	352,329	74.1	835,103	72.0
Pacific cod	35,616	4,053	8	182	39,859	8.4	63,942	5.5
Sablefish	73	36	<1	<1	109	<0.1	430	<0.1
Atka mackerel	1	5	<1	<1	6	<0.1	31,984	2.8
Ocean perch spp.[d]	24	7	<1	0	31	<0.1	518	<0.1
Other rockfishes	4	0	<1	<1	4	<0.1	27	<0.1
Pacific herring[e]	199	52	2	<1	253	0.1	3,764	0.3
Other fish	3,230	801	1	12	4,044	0.8	7,557	0.7
Snails	493	0	0	0	493	0.1	0	0.0
Total	369,683	97,386	6,854	2,001	475,924		1,160,213	
Percent	77.7	20.5	1.4	0.4				

[a] See text for description of the technique used to estimate non-U.S. and joint venture catches.
[b] In 1986, joint venture fisheries were conducted between U.S. catcher boats and processing vessels from Japan, the Republic of Korea, Poland, the U.S.S.R., and the Peoples Republic of China (PRC).
[c] Arrowtooth includes arrowtooth flounder (Atheresthes stomias) and Kamchatka flounder (A. evermanni).
[d] Ocean perch species include Pacific ocean perch, Sebastes alutus; northern rockfish, S. polyspinis; rougheye rockfish, S. aleutianus; shorttaker rockfish, S. borealis; and gharpchin rockfish, S. zacentrus.
[e] Non-U.S. groundfish vessels were not allowed to retain Pacific herring in 1986.

Table 4.--Estimated catches of groundfish (1,000s t) taken by the foreign and joint venture fisheries in the Bering Sea/Aleutian Islands region, 1977-S6[a].

Fisheries/ species group	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Foreign directed catches										
Pollock	978.4	979.4	944.0	1,006.1	986.9	959.3	891.5	933.0	820.3	352.3
Pacific cod	35.9	47.4	41.4	37.3	39.1	28.2	41.5	58.5	57.2	39.3
Sablefish	4.6	2.0	2.2	2.4	3.0	3.8	3.2	1.9	0.3	0.1
Atka mackerel	NA	24.2	23.3	20.2	18.1	7.4	1.2	0.1	<0.1	<0.1
All rockfish	10.8	7.5	7.2	8.5	7.3	4.9	2.0	0.9	0.1	<0.1
Yellowfin sole	0.3[b]	110.3	101.1	77.8	81.3	76.0	85.9	126.8	100.7	57.2
Turbots and other flatfish	136.4[b]	125.5	90.0	88.5	91.9	79.3	80.3	59.3	46.9	20.8
Pacific herring	19.3	8.4	7.5	0.8	0.3	1.9	1.4	1.3	1.5	0.3
Other fish	94.7	71.8	64.7	47.0	39.4	22.3	14.3	7.5	6.3	4.0
Squid	8.4	9.4	7.0	6.4	5.9	5.0	4.0	3.1	1.6	0.8
Snails	0.4	2.2	0.5	0.1	0.2	0.2	0.3	0.2	0.1	0.5
TOTAL	1,289.1	1,385.5	1,288.9	1,295.1	1,273.4	1,188.4	1,125.5	1,192.7	1,035.0	475.9
Joint venture catches										
Pollock	--	--	--	10.7	42.1	54.6	149.0	237.0	377.5	835.1
Pacific cod	--	--	--	8.5	9.2	13.6	14.4	30.8	41.3	63.9
Sablefish	--	--	--	<0.1	0.2	0.1	0.1	0.3	0.1	0.4
Atka mackerel	--	--	--	0.3	1.6	12.5	10.5	35.9	37.9	32.0
All rockfish	--	--	--	0.1	<0.1	<0.1	0.1	0.6	0.5	0.5
Yellowfin sole	--	--	--	9.6	16.0	17.4	22.5	32.8	126.4	151.4
Turbots and other flatfish	--	--	--	2.8	6.0	9.2	11.8	17.4	46.3	65.5
Pacific herring	--	--	--	0.0	0.0	<0.1	1.1	1.8	3.1	3.8
Other fish	--	--	--	0.7	3.4	1.1	1.6	2.6	6.3	7.6
Squid	--	--	--	0.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Snails	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	--	--	--	32.6	78.5	108.6	211.2	359.3	639.4	1,160.2

[a] Statistics for 1977-85 from Berger et al. 1987.

[b] Japan reported yellowfin sole combined with other flounders.

Table S.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	0.002	3.200	--	--	0.000	0.000	--	--
March	0.011	3.289	--	--	--	--	--	--
April	0.005	4.748	0.001	4.608	--	--	--	--
May	0.005	3.333	--	--	--	--	--	--
June	0.005	3.974	0.008	3.026	0.008	2.220	--	--
July	0.012	3.153	0.009	1.741	--	--	--	--
Aug.	0.028	3.498	0.005	2.362	--	--	--	--
Sep.	0.027	3.403	0.006	4.422	--	--	--	--
Oct.	0.028	3.260	--	--	--	--	--	--
Nov.	0.064	2.940	--	--	--	--	--	--
Dec.	0.022	3.782	--	--	--	--	--	--
Annual	0.013	3.418	0.006	2.424	0.006	2.220	--	--
U.S.-Poland JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.091	3.631	--	--	--	--	--	--
April	0.007	5.125	--	--	--	--	--	--
May	0.015	3.586	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.025	2.797	--	--	--	--	--	--
Oct.	0.028	3.177	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.020	3.843	--	--	--	--	--	--

* Exclusive Economic Zone

Table 5.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.007	8.705	--	--	--	--	--	--
April	0.004	5.113	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--	--	--
Nov.	0.018	4.572	--	--	--	--	--	--
Dec.	0.093	2.114	--	--	--	--	--	--
Annual	0.017	3.166	--	--	--	--	--	--

* Exclusive Economic Zone

Table 5.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986. Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.000	2.300	--	--	--	--
July	--	--	0.000	3.649	--	--	--	--
Aug.	--	--	0.001	2.418	--	--	--	--
Sep.	--	--	<0.001	2.600	--	--	--	--
Oct.	--	--	0.001	3.040	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.001	2.713	--	--	--	--
Japanese Freezer Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	0.000	0.000	--	--	--	--	--	--
July	0.000	0.000	--	--	--	--	--	--
Aug.	0.000	0.000	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.000	0.000	--	--	--	--	--	--

* Exclusive Economic Zone

Table 5.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Small Trawler								
Jan.	--	--	--	--	--	--	0.001	6.000
Feb.	--	--	--	--	0.000	0.000	--	--
March	0.000	0.000	0.049	1.757	0.014	1.354	--	--
April	0.000	0.000	0.009	0.817	0.056	1.774	--	--
May	--	--	0.000	0.000	--	--	--	--
June	0.003	5.640	0.000	0.000	--	--	--	--
July	0.000	0.000	0.000	0.000	NS	NS	--	--
Aug.	0.000	0.000	0.006	4.031	0.000	0.000	--	--
Sep.	0.003	3.666	0.006	3.426	--	--	--	--
Oct.	0.000	0.000	0.010	3.170	--	--	--	--
Nov.	0.000	0.000	0.068	3.740	--	--	--	--
Dec.	0.000	0.000	0.000	0.000	0.004	2.281	--	--
Annual	<0.001	3.913	0.018	3.304	0.016	1.655	0.001	6.000
Japanese Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.042	5.560	0.000	0.000	--	--	--	--
April	--	--	--	--	--	--	--	--
May	0.000	0.000	0.000	0.000	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.002	3.800	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--	--	--
Nov.	0.003	1.663	--	--	--	--	--	--
Dec.	0.000	0.000	--	--	--	--	--	--
Annual	0.002	2.870	0.000	0.000	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling-by U.S. observers.

Table 5.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Large Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.002	0.400	--	--	--	--
Aug.	0.006	2.843	0.001	5.200	--	--	--	--
Sep.	0.003	5.350	0.002	6.277	--	--	--	--
Oct.	0.004	4.700	0.000	0.000	--	--	--	--
Nov.	0.020	3.313	0.017	4.985	--	--	--	--
Dec.	--	--	0.015	5.315	--	--	0.021	1.250
Annual	0.007	3.749	0.007	5.087	--	--	0.021	1.250
Japanese Longliners Fishing <500 m								
Jan.	--	--	0.000	0.000	--	--	--	--
Feb.	NS	NS	0.000	0.000	--	--	--	--
March	--	--	0.000	0.000	--	--	--	--
April	--	--	0.000	0.000	--	--	--	--
May	--	--	0.000	0.000	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	0.011	3.500	--	--	--	--
Sep.	--	--	0.000	0.000	--	--	--	--
Oct.	--	--	0.000	0.000	--	--	--	--
Nov.	--	--	0.000	0.000	--	--	--	--
Dec.	NS	NS	0.000	0.000	--	--	--	--
Annual	NS	NS	<0.001	3.500	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 5.-- Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	0.000	0.000	--	--	0.000	0.000
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.032	3.486	--	--	--	--	--	--
Oct.	0.016	3.370	--	--	0.031	2.040	--	--
Nov.	0.100	2.366	--	--	0.012	2.993	--	--
Dec.	--	--	--	--	NS	NS	--	--
Annual	0.046	2.712	0.000	0.000	0.029	2.082	0.000	0.000
Republic of Korea Small Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	0.000	0.000	--	--
March	--	--	NS	NS	NS	NS	0.000	0.000
April	--	--	--	--	--	--	--	--
May	0.014	3.220	--	--	--	--	--	--
June	0.000	0.000	--	--	--	--	--	--
July	NS	NS	--	--	--	--	--	--
Aug.	0.000	0.000	--	--	--	--	--	--
Sep.	0.006	2.600	--	--	--	--	--	--
Oct.	0.002	4.700	--	--	--	--	--	--
Nov.	0.000	0.000	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.003	3.060	NS	NS	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 5.-- Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Republic of Korea Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	0.004	1.400	0.001	3.400	0.000	0.000
March	0.000	0.000	0.004	1.329	0.000	0.000	0.000	0.000
April	0.000	0.000	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--	0.000	0.000
June	0.001	2.991	--	--	--	--	--	--
July	0.000	0.000	0.000	0.000	--	--	--	--
Aug.	0.006	3.802	0.000	0.000	--	--	--	--
Sep.	0.006	3.428	0.006	4.800	--	--	--	--
Oct.	0.008	3.238	--	--	--	--	--	--
Nov.	0.007	2.844	--	--	--	--	--	--
Dec.	NS	NS	--	--	--	--	--	--
Annual	0.004	3.302	0.003	1.578	0.001	3.400	0.000	0.000
Peoples Republic of China Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	NS	NS	NS	NS	--	--	--	--
March	--	--	1.000	1.133	0.196	0.994	--	--
April	--	--	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--	0.000	0.000
June	0.019	2.787	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	0.000	0.000	--	--	--	--	--	--
Dec.	0.179	1.499	--	--	--	--	--	--
Annual	0.057	1.697	0.822	1.133	0.196	0.994	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 5.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued)Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-U.S.S.R JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	0.002	1.971	--	--	--	--	--	--
March	0.011	3.933	NS	NS	--	--	--	--
April	<0.001	0.650	NS	NS	0.000	0.000	--	--
May	0.000	0.000	--	--	0.000	0.000	--	--
June	0.001	3.556	0.000	0.000	0.002	2.628	--	--
July	0.002	3.185	--	--	0.041	1.994	--	--
Aug.	0.000	0.000	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.001	3.670	0.000	0.000	0.012	2.020	--	--
U.S.-Republic of Korea JV Mothership								
Jan.	0.053	3.200	--	--	--	--	--	--
Feb.	0.005	2.455	--	--	0.004	2.165	--	--
March	0.008	2.638	--	--	--	--	--	--
April	0.002	4.760	--	--	0.000	0.000	--	--
May	0.002	5.094	--	--	0.011	2.465	--	--
June	0.002	4.878	--	--	0.003	2.734	--	--
July	0.001	2.919	0.001	2.883	0.015	3.463	--	--
Aug.	0.376	3.669	0.001	2.168	0.004	1.400	--	--
Sep.	0.046	3.259	0.012	3.200	--	--	--	--
Oct.	0.023	3.294	--	--	--	--	--	--
Nov.	0.020	3.666	--	--	--	--	--	--
Dec.	0.024	3.205	--	--	--	--	--	--
Annual	0.044	3.540	0.001	2.523	0.008	2.911	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 6.--Estimated incidental catches of Pacific salmon (in numbers of fish and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea/Aleutian region, 1986.

	Number of fish					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
Foreign groundfish vessels										
Japan										
SMS	-	121	-	-	121	-	0.33	-	-	0.33
FMS	0	-	-	-	0	0.00	-	-	-	0.00
SST	11	327	-	95	433	0.04	1.09	-	0.16	1.29
LST	42	244	-	-	286	0.16	1.24	-	-	1.40
LFT	10	0	-	-	10	0.03	0.00	-	-	0.03
LL	0	5	-	-	5	0.00	0.02	-	-	0.02
Republic of Korea (ROK)										
SST	22	1	-	0	23	0.07	<0.01	-	0.00	0.07
LFT	310	17	-	5	332	1.03	0.03	-	0.02	1.08
Poland										
LFT	149	-	-	94	243	0.40	-	-	0.19	0.59
Peoples Republic of China (PRC)										
LFT	62	50	-	78	190	0.11	0.06	-	0.08	0.25
All nations total	606	765	-	272	1,643	1.84	2.77	-	0.45	5.06
Percent by area	36.88	46.56	-	16.56		36.36	54.74	-	8.90	
Joint venture vessels										
U.S.-Japan	3,573	1,598	-	8	5,179	12.37	3.77	-	0.02	16.16
U.S.-ROK	13,041	53	-	362	13,456	46.17	0.14	-	1.05	47.36
U.S.-Poland	167	-	-	-	167	0.64	-	-	-	0.64
U.S.-PRC	132	-	-	-	132	0.39	-	-	-	0.39
U.S.-U.S.S.R.	222	0	-	184	406	0.80	0.00	-	0.37	1.17
Joint venture totals	17,135	1,651	-	554	19,340	60.37	3.91	-	1.44	65.72
Percent by area	88.60	8.54	-	2.86		91.86	5.95	-	2.19	

SMS = Surimi motherships
FMS = Freezer motherships
SST = Small stern trawler
LST = Large surimi trawler
LFT = Large freezer trawler
LL = Longliner

Table 7.--Estimated incidental catches (numbers and metric tons) of salmon (*Oncorhynchus* spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea/Aleutian Islands region, 1977-86*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	47,840	198	NF	NF	47,840	198
1978	44,548	137	NF	NF	44,548	137
1979	107,706	340	NF	NF	107,706	340
1980	120,104	381	1,898	7	122,002	388
1981	42,337	137	854	3	43,191	140
1982	21,241	85	2,382	8	23,623	92
1983	18,173	66	24,493	54	42,666	120
1984	16,516	51	67,622	160	84,138	211
1985	10,003	33	10,420	30	20,423	63
1986	1,643	5	19,340	66	20,983	71

* Estimated catches for years 1977-85 from Berger et al. 1987.

NF = No fishing.

Table 8.--Biological data on the incidental catch of Pacific salmon in the foreign and joint venture groundfish fishery in the Bering Sea/ Aleutian Islands region, 1986.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Foreign directed fisheries					
Chinook	59.55	Male	37.49	3.08	56.7
		Female	44.43	2.99	58.7
		Unsexed	18.08	4.01	62.3
		Combined		3.21	58.6
Chum	37.77	Male	50.67	2.86	59.9
		Female	43.88	3.30	60.7
		Unsexed	5.44	3.53	64.5
		Combined		3.09	60.5
Coho	2.20	Male	76.19	1.00	39.5
		Female	18.04	2.54	57.0
		Unsexed	5.76	4.70	68.0
		Combined		1.47	44.3
Sockeye	0.49	Male	33.14	2.85	61.2
		Female	50.38	2.34	57.2
		Unsexed	16.49	4.70	68.0
		Combined		2.90	60.3
Joint venture fisheries					
Chinook	25.02	Male	45.18	3.50	62.5
		Female	50.47	3.86	64.6
		Unsexed	4.35	3.75	58.8
		Combined		3.69	63.4
Chum	71.42	Male	49.70	3.37	62.0
		Female	42.74	3.44	62.4
		Unsexed	7.56	3.08	62.2
		Combined		3.38	62.1
Coho	0.20	Male	13.76	1.30	51.0
		Female	55.84	3.80	66.5
		Unsexed	30.40	2.80	59.6
		Combined		3.15	62.3
Sockeye	3.31	Male	51.70	3.56	65.3
		Female	46.69	3.71	65.8
		Unsexed	1.61	3.33	63.8
		Combined		3.63	65.5
Pink	0.05	Male	19.84	0.30	28.0
		Female	80.16	1.30	43.0
		Unsexed	0.00	--	--
		Combined		1.10	40.0

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986. Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.011	1.061	--	--	--	--
July	--	--	0.001	3.890	--	--	--	--
Aug.	--	--	0.001	6.191	--	--	--	--
Sep.	--	--	0.001	7.828	--	--	--	--
Oct.	--	--	0.000	0.000	--	-	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.002	3.639	--	--	--	--
Japanese Freezer Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	1.280	3.009	--	--	--	--	--	--
July	1.644	2.776	--	--	--	--	--	--
Aug.	0.784	2.888	--	--	--	--	--	--
Sep.	0.226	4.506	--	--	--	--	--	--
Oct.	1.455	3.571	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	1.010	3.087	--	--	--	--	--	--

* Exclusive Economic Zone

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Small Trawler								
Jan.	--	--	--	--	--	--	0.000	0.000
Feb.	--	--	--	--	0.000	0.000	--	--
March	0.335	5.077	0.041	6.523	0.000	0.000	--	--
April	0.803	5.844	0.664	5.848	0.000	0.000	--	--
May	--	--	0.366	6.723	--	--	--	--
June	2.190	5.007	0.835	4.388	--	--	--	--
July	0.085	10.429	0.598	4.733	NS	NS	--	--
Aug.	2.404	7.939	1.260	5.318	0.000	0.000	--	--
Sep.	1.360	7.351	0.429	5.385	--	--	--	--
Oct.	0.237	7.771	0.357	5.690	--	--	--	--
Nov.	1.328	4.816	1.404	4.674	--	--	--	--
Dec.	0.995	5.163	0.572	6.129	0.000	0.000	--	--
Annual	1.041	5.828	0.733	5.083	0.000	0.000	0.000	0.000
Japanese Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	4.270	2.648	0.194	2.394	--	--	--	--
April	--	--	--	--	--	--	--	--
May	2.563	5.011	3.039	4.165	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	1.828	7.372	--	--	--	--	--	--
Sep.	2.000	7.667	--	--	--	--	--	--
Oct.	2.656	5.736	--	--	--	--	--	--
Nov.	2.142	4.766	--	--	--	--	--	--
Dec.	1.269	4.885	--	--	--	--	--	--
Annual	1.799	5.312	0.244	2.786	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Large Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.015	3.510	--	--	--	--
Aug.	0.008	3.130	0.031	6.125	--	--	--	--
Sep.	0.024	14.057	0.001	17.875	--	--	--	--
Oct.	0.338	7.448	0.084	6.715	--	--	--	--
Nov.	0.030	4.809	0.045	4.537	--	--	--	--
Dec.	--	--	0.003	14.777	--	--	0.000	0.000
Annual	0.077	7.967	0.024	5.687	--	--	0.000	0.000
Japanese Longliners Fishing <500 m								
Jan.	--	--	9.498	3.113	--	--	--	--
Feb.	NS	NS	4.035	3.538	--	--	--	--
March	--	--	4.450	2.304	--	--	--	--
April	--	--	4.142	2.591	--	--	--	--
May	--	--	4.575	3.568	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	3.052	3.082	--	--	--	--
Sep.	--	--	7.412	3.456	--	--	--	--
Oct.	--	--	6.610	3.916	--	--	--	--
Nov.	--	--	9.303	4.011	--	--	--	--
Dec.	NS	NS	2.511	3.753	--	--	--	--
Annual	NS	NS	6.324	3.833	--	--	--	--

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NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	0.000	0.000	--	--	0.000	0.000
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.001	1.820	--	--	0.000	0.000	--	--
Nov.	0.000	0.000	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	NS	NS	--	--
Annual	<0.001	1.820	0.000	0.000	0.000	0.000	0.000	0.000
Republic of Korea Small Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	0.000	0.000	--	--
March	--	--	NS	NS	NS	NS	0.000	0.000
April	--	--	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--	--	--
June	0.267	5.619	--	--	--	--	--	--
July	NS	NS	--	--	--	--	--	--
Aug.	0.375	2.747	--	--	--	--	--	--
Sep.	0.620	3.503	--	--	--	--	--	--
Oct.	0.368	5.272	--	--	--	--	--	--
Nov.	0.358	2.097	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.335	4.141	NS	NS	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Republic of Korea Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000	0.000	0.000
March	0.732	2.371	0.000	0.000	0.000	0.000	0.000	0.000
April	0.000	0.000	--	--	--	--	--	--
May	0.061	5.384	--	--	--	--	0.000	0.000
June	0.246	3.925	--	--	--	--	--	--
July	0.412	3.951	0.689	3.479	--	--	--	--
Aug.	0.340	6.027	0.386	3.637	--	--	--	--
Sep.	0.284	4.962	0.054	8.004	--	--	--	--
Oct.	0.342	3.758	--	--	--	--	--	--
Nov.	0.539	3.343	--	--	--	--	--	--
Dec.	NS	NS	--	--	--	--	--	--
Annual	0.340	4.169	0.128	3.601	0.000	0.000	0.000	0.000
Peoples Republic of China Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	NS	NS	NS	NS	--	--	--	--
March	--	--	0.000	0.000	0.000	0.000	--	--
April	--	--	--	--	--	--	--	--
May	4.535	2.933	--	--	--	--	0.000	0.000
June	1.594	2.642	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	0.959	7.968	--	--	--	--	--	--
Dec.	0.740	4.095	--	--	--	--	--	--
Annual	1.977	3.043	0.000	0.000	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-U.S.S.R JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	8.636	0.998	--	--	--	--	--	--
March	5.237	0.933	NS	NS	--	--	--	--
April	0.099	4.927	NS	NS	0.047	3.070	--	--
May	1.577	2.766	--	--	0.318	3.609	--	--
June	1.765	2.328	0.000	0.000	0.813	5.770	--	--
July	1.014	3.761	--	--	0.877	3.331	--	--
Aug.	1.327	3.801	--	--	--	--	--	--
Sep.	0.143	11.568	--	--	--	--	--	--
Oct.	0.208	6.385	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	1.761	2.075	0.000	0.000	0.620	4.419	--	--
U.S.-Republic of Korea JV Mothership								
Jan.	0.055	4.000	--	--	--	--	--	--
Feb.	0.093	2.651	--	--	0.000	0.000	--	--
March	0.182	1.811	--	--	--	--	--	--
April	0.799	2.312	--	--	0.108	4.000	--	--
May	0.449	3.309	--	--	0.639	3.884	--	--
June	0.168	4.299	--	--	0.322	4.806	--	--
July	0.565	3.769	0.425	3.126	0.574	3.159	--	--
Aug.	0.844	3.649	0.123	3.249	1.512	4.211	--	--
Sep.	0.568	3.897	0.012	2.800	--	--	--	--
Oct.	0.936	3.534	--	--	--	--	--	--
Nov.	1.078	3.263	--	--	--	--	--	--
Dec.	0.656	3.343	--	--	--	--	--	--
Annual	0.499	3.237	0.235	3.166	0.395	3.825	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	0.000	0.000	--	--	0.000	0.000	--	--
March	0.013	2.670	--	--	--	--	--	--
April	0.020	4.449	<0.001	6.617	--	--	--	--
May	1.196	3.689	--	--	--	--	--	--
June	0.808	3.488	0.078	6.526	0.115	3.556	--	--
July	0.180	2.997	0.013	4.167	--	--	--	--
Aug.	0.205	5.647	0.001	4.754	--	--	--	--
Sep.	0.802	4.770	0.006	4.203	--	--	--	--
Oct.	1.226	4.141	--	--	--	--	--	--
Nov.	0.682	2.625	--	--	--	--	--	--
Dec.	0.113	2.136	--	--	--	--	--	--
Annual	0.348	3.948	0.008	4.613	0.096	3.556	--	--
U.S.-Poland JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.000	0.000	--	--	--	--	--	--
April	0.629	1.996	--	--	--	--	--	--
May	0.418	2.623	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	2.309	3.566	--	--	--	--	--	--
Oct.	2.621	2.848	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.737	2.426	--	--	--	--	--	--

* Exclusive Economic Zone

Table 9.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.003	2.900	--	--	--	--	--	--
April	1.199	2.081	--	--	--	--	--	--
May	1.132	1.552	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	1.749	2.963	--	--	--	--	--	--
Nov.	3.076	3.553	--	--	--	--	--	--
Dec.	0.422	1.918	--	--	--	--	--	--
Annual	0.988	2.352	--	--	--	--	--	--

* Exclusive Economic Zone

Table 10.-Estimated incidental catches of Pacific halibut (in numbers of fish and *metric tons)* by foreign groundfish and joint venture vessels in the Bering Sea/Aleutian region, 1986.

	Number of fish					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
Foreign groundfish vessels										
Japan										
SMS	-	294	-	-	294	-	1.14	-	-	1.14
FMS	36,449	-	-	-	36,449	112.20	-	-	-	112.20
SST	22,595	11,894	-	0	34,489	131.99	60.00	-	0.00	191.99
LST	782	730	-	-	1,512	6.04	4.00	-	-	10.04
LFT	11,493	250	-	-	11,743	62.43	0.65	-	-	63.08
LL	1,499	177,306	-	-	178,805	5.40	674.43	-	-	679.83
Republic of Korea (ROK)										
SST	2,906	0	-	0	2,906	11.95	0.00	-	0.00	11.95
LFT	26,845	27	-	0	26,872	111.93	0.14	-	0.00	112.07
Poland										
LFT	2	-	-	0	2	<0.01	-	-	0.00	<0.01
Peoples Republic of China (PRC)										
LFT	3,300	0	-	0	3,300	9.81	0.00	-	0.00	9.81
All nations total	105,871	190,501	-	0	296,372	451.75	740.36	-	0.00	1,192.11
Percent by area	35.72	64.28	-	0.00		37.89	62.11	-	0.00	
Joint venture vessels										
U.S.-Japan	99,846	1,994	-	123	101,963	385.75	9.19	-	0.43	395.37
U.S.-ROK	145,109	5,283	-	16,583	166,975	469.44	16.67	-	64.16	550.27
U.S.-Poland	5,921	-	-	-	5,921	13.45	-	-	-	13.45
U.S.-PRC	6,397	-	-	-	6,397	13.51	-	-	-	13.51
U.S.-U.S.S.R.	300,654	145	-	11,542	312,341	684.05	1.34	-	53.50	738.89
Joint venture totals	557,927	7,422	-	28,248	593,597	1,566.20	27.20	-	118.09	1,711.49
Percent by area	93.99	1.25	-	4.76		91.51	1.59	-	6.90	

SMS = Surimi motherships
FMS = Freezer motherships
SST = Small stern trawler
LST = Large surimi trawler
LFT = Large freezer trawler
LL = Longliner

Table 11 .--Estimated incidental catches (numbers and metric tons) of Pacific halibut (Hippoglossus stenolepis) in the foreign and U.S. joint venture groundfish fisheries in the Bering Sea/Aleutian Islands region, 1977-86*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	344,973	1,453	NF	NF	344,973	1,453
1978	599,852	2,853	NF	NF	599,852	2,853
1979	583,811	2,863	NF	NF	583,811	2,863
1980	959,566	4,311	204,948	286	1,164,514	4,597
1981	988,731	2,704	103,616	232	1,092,347	2,936
1982	423,340	1,609	412,115	563	835,455	2,172
1983	515,587	1,872	274,080	438	789,667	2,310
1984	518,327	2,128	254,273	617	772,600	2,745
1985	485,311	1,789	447,370	1,026	932,681	2,815
1986	296,372	1,192	593,597	1,711	889,969	2,903

* Estimated catches for years 1977-85 from Berger et al. 1987.

NF = no fishing.

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986. Lines indicate areas not finished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.077	0.049	--	--	--	--
July	--	--	0.021	0.136	--	--	--	--
Aug.	--	--	0.041	0.115	--	--	--	--
Sep.	--	--	0.116	0.157	--	--	--	--
Oct.	--	--	0.014	0.211	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.057	0.136	--	--	--	--
Japanese Freezer Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	0.042	0.007	--	--	--	--	--	--
July	0.081	0.106	--	--	--	--	--	--
Aug.	0.044	0.013	--	--	--	--	--	--
Sep.	5.749	0.138	--	--	--	--	--	--
Oct.	0.617	0.014	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	1.454	0.128	--	--	--	--	--	--

* Exclusive Economic Zone

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1966 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Small Trawler								
Jan.	--	--	--	--	--	--	0.000	0.000
Feb.	--	--	--	--	0.000	0.000	--	--
March	2.324	0.461	0.001	0.100	0.000	0.000	--	--
April	4.087	0.458	9.255	0.214	0.000	0.000	--	--
May	--	--	1.363	0.298	--	--	--	--
June	7.370	0.159	2.913	0.193	--	--	--	--
July	7.064	0.361	3.729	0.165	NS	NS	--	--
Aug.	0.462	0.083	2.554	0.135	0.000	0.000	--	--
Sep.	7.262	0.181	2.488	0.098	--	--	--	--
Oct.	45.674	0.184	42.444	0.202	--	--	--	--
Nov.	39.634	0.137	7.392	0.200	--	--	--	--
Dec.	21.213	0.097	176.174	0.179	0.000	0.000	--	--
Annual	28.281	0.150	13.926	0.196	0.000	0.000	0.000	0.000
Japanese Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	13.833	0.137	8.045	0.215	--	--	--	--
April	--	--	--	--	--	--	--	--
May	69.200	0.068	355.956	0.126	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.091	0.015	--	--	--	--	--	--
Sep.	0.833	0.018	--	--	--	--	--	--
Oct.	0.237	0.028	--	--	--	--	--	--
Nov.	0.373	0.047	--	--	--	--	--	--
Dec.	8.971	0.069	--	--	--	--	--	--
Annual	5.266	0.069	14.232	0.176	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Large Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.039	0.070	--	--	--	--
Aug.	0.003	0.267	1.109	0.218	--	--	--	--
Sep.	0.084	0.080	0.420	0.313	--	--	--	--
Oct.	9.295	0.146	0.075	0.141	--	--	--	--
Nov.	0.001	1.500	2.097	0.112	--	--	--	--
Dec.	--	--	0.049	0.060	--	--	0.000	0.000
Annual	1.709	0.145	0.874	0.167	--	--	0.000	0.000
Japanese Longliners Fishing <500 m								
Jan.	--	--	2.083	0.576	--	--	--	--
Feb.	NS	NS	5.807	0.549	--	--	--	--
March	--	--	0.000	0.000	--	--	--	--
April	--	--	0.061	0.459	--	--	--	--
May	--	--	0.519	0.527	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	0.327	0.490	--	--	--	--
Sep.	--	--	0.075	0.200	--	--	--	--
Oct.	--	--	1.211	0.584	--	--	--	--
Nov.	--	--	2.839	0.565	--	--	--	--
Dec.	NS	NS	2.977	0.579	--	--	--	--
Annual	NS	NS	2.900	0.562	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	0.000	0.000	--	--	0.000	0.000
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.001	2.800	--	--	0.000	0.000	--	--
Nov.	0.001	0.020	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	NS	NS	--	--
Annual	0.001	1.412	0.000	0.000	0.000	0.000	0.000	0.000
Republic of Korea Small Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	0.000	0.000	--	--
March	--	--	NS	NS	NS	NS	0.000	0.000
April	--	--	--	--	--	--	--	--
May	0.012	0.405	--	--	--	--	--	--
June	1.326	0.237	--	--	--	--	--	--
July	NS	NS	--	--	--	--	--	--
Aug.	0.693	0.509	--	--	--	--	--	--
Sep.	1.542	0.345	--	--	--	--	--	--
Oct.	10.375	0.160	--	--	--	--	--	--
Nov.	3.032	0.080	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	2.146	0.212	NS	NS	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Republic of Korea Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000	0.000	0.000
March	0.097	0.441	0.000	0.000	0.000	0.000	0.000	0.000
April	23.074	0.116	--	--	--	--	--	--
May	0.636	0.453	--	--	--	--	0.000	0.000
June	0.654	0.335	--	--	--	--	--	--
July	0.688	0.224	1.889	0.178	--	--	--	--
Aug.	1.095	0.121	1.110	0.376	--	--	--	--
Sep.	8.943	0.118	1.442	0.357	--	--	--	--
Oct.	18.455	0.108	--	--	--	--	--	--
Nov.	1.241	0.130	--	--	--	--	--	--
Dec.	NS	NS	--	--	--	--	--	--
Annual	5.248	0.121	0.404	0.259	0.000	0.000	0.000	0.000
Peoples Republic of China Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	NS	NS	NS	NS	--	--	--	--
March	--	--	0.000	0.000	0.000	0.000	--	--
April	--	--	--	--	--	--	--	--
May	57.795	0.063	--	--	--	--	0.000	0.000
June	13.999	0.115	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	0.259	0.240	--	--	--	--	--	--
Dec.	0.669	0.336	--	--	--	--	--	--
Annual	19.358	0.084	0.000	0.000	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.-- Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-U.S.S.R JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	6.473	0.177	--	--	--	--	--	--
March	5.912	0.185	NS	NS	--	--	--	--
April	2.406	0.233	NS	NS	0.000	0.000	--	--
May	5.834	0.072	--	--	0.000	0.000	--	--
June	105.619	0.025	240.299	0.060	0.000	0.000	--	--
July	2.039	0.056	--	--	0.000	0.000	--	--
Aug.	2.574	0.091	--	--	--	--	--	--
Sep.	6.249	0.173	--	--	--	--	--	--
Oct.	2.523	0.079	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	19.108	0.043	240.299	0.060	0.000	0.000	--	--
U.S.-Republic of Korea JV Mothership								
Jan.	0.003	0.500	--	--	--	--	--	--
Feb.	0.115	0.331	--	--	0.000	0.000	--	--
March	0.467	0.328	--	--	--	--	--	--
April	1.997	0.352	--	--	0.000	0.000	--	--
May	0.738	0.198	--	--	<0.001	0.150	--	--
June	0.148	0.351	--	--	0.000	0.000	--	--
July	0.473	0.411	0.673	0.329	0.000	0.000	--	--
Aug.	1.101	0.405	0.887	0.214	0.479	2.500	--	--
Sep.	2.536	0.235	0.347	0.460	--	--	--	--
Oct.	4.346	0.198	--	--	--	--	--	--
Nov.	0.802	0.393	--	--	--	--	--	--
Dec.	0.105	0.668	--	--	--	--	--	--
Annual	1.357	0.267	0.804	0.251	0.009	2.492	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	0.000	0.000	--	--	0.000	0.000	--	--
March	0.006	0.285	--	--	--	--	--	--
April	0.513	0.217	0.000	0.000	--	--	--	--
May	12.065	0.074	--	--	--	--	--	--
June	61.046	0.050	0.040	0.313	0.000	0.000	--	--
July	0.113	0.442	0.013	0.191	--	--	--	--
Aug.	0.685	0.285	0.002	0.298	--	--	--	--
Sep.	3.037	0.189	0.087	0.207	--	--	--	--
Oct.	2.371	0.228	--	--	--	--	--	--
Nov.	0.618	0.336	--	--	--	--	--	--
Dec.	0.000	0.000	--	--	--	--	--	--
Annual	6.552	0.067	0.021	0.209	0.000	0.000	--	--
U.S.-Poland JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.011	0.650	--	--	--	--	--	--
April	0.124	0.355	--	--	--	--	--	--
May	0.099	0.398	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.453	0.088	--	--	--	--	--	--
Oct.	0.916	0.529	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.188	0.433	--	--	--	--	--	--

* Exclusive Economic Zone

Table 12.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.002	0.400	--	--	--	--	--	--
April	0.753	0.257	--	--	--	--	--	--
May	0.100	0.278	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	0.374	0.577	--	--	--	--	--	--
Nov.	0.427	0.391	--	--	--	--	--	--
Dec.	0.084	0.479	--	--	--	--	--	--
Annual	0.428	0.275	--	--	--	--	--	--

*Exclusive Economic Zone

Table 13.--Estimated incidental catches of Tanner crab (in numbers of crab and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea/Aleutian region, 1986.

	Number of crab					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
Foreign groundfish vessels										
Japan										
SMS	-	11,863	-	-	11,863	-	1.63	-	-	1.63
FMS	40,846	-	-	-	40,846	5.06	-	-	-	5.06
SST	665,226	287,942	-	0	953,168	102.01	56.83	-	0.00	158.84
LST	19,159	29,012	-	-	48,171	2.78	4.57	-	-	7.35
LFT	32,865	12,755	-	-	45,620	2.27	2.41	-	-	4.68
LL	2,045	78,437	-	-	80,482	1.14	44.11	-	-	45.25
Republic of Korea (ROK)										
SST	22,105	0	-	0	22,105	4.49	0.00	-	0.00	4.49
LFT	416,225	659	-	0	416,884	50.13	0.15	-	0.00	50.28
Poland										
LFT	3	-	-	0	3	<0.01	-	-	0.00	<0.01
Peoples Republic of China (PRC)										
LFT	33,600	0	-	0	33,600	2.81	0.00	-	0.00	2.81
All nations total	1,232,074	420,668	-	0	1,652,742	170.69	109.70	-	0.00	280.39
Percent by area	74.55	25.45	-	0.00		60.88	39.12	-	0.00	
Joint venture vessels										
U.S.-Japan	1,770,071	4,989	-	0	1,775,060	120.72	1.04	-	0.00	121.76
U.S.-ROK	380,811	13,234	-	1	394,046	102.32	3.43	-	<0.01	105.75
U.S.-Poland	1,449	-	-	-	1,449	0.64	-	-	-	0.64
U.S.-PRC	2,797	-	-	-	2,797	0.79	-	-	-	0.79
U.S.-U.S.S.R.	3,368,060	1,360	-	0	3,369,420	141.12	0.08	-	0.00	141.20
Joint venture totals	5,523,188	19,583	-	1	5,542,772	365.59	4.55	-	<0.01	370.14
Percent by area	99.65	0.35	-	<0.01		98.77	1.23	-	<0.01	

SMS = Surimi motherships
FMS = Freezer motherships
SST = Small stern trawler
LST = Large surimi trawler
LFT = Large freezer trawler
LL = Longliner

Table 14. --Estimated incidental catches (numbers and metric tons) of Tanner crab (Chionoecetes spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea/Aleutian Islands region, 1977-86*.

	Foreign		Joint Venture		Total	
Year	Millions of crab	t	Millions of crab	t	Millions of crab	t
1977	17.6	3,728	NF	NF	17.6	3,728
1978	17.3	4,267	NF	NF	17.3	4,267
1979	18.0	3,654	NF	NF	18.0	3,654
1980	11.1	2,058	0.3	56	11.4	2,114
1981	5.6	1,196	0.7	276	6.3	1,472
1982	2.3	425	0.1	24	2.4	448
1983	2.5	501	0.5	171	3.0	672
1984	2.6	527	0.4	119	3.0	646
1985	1.8	263	0.9	134	2.7	397
1986	1.7	280	5.5	370	7.2	650

* Estimated catches for years 1977-85 from Berger et al. 1987.

NF = no fishing.

Table 15.--Catches of Tanner crab by species and zone made by the yellowfin sole/flatfish joint venture fishery, 1986.

	Chionoecetes bairdi	Other Tanner crab
Zone 1	115,348	60,756
Zone 2	132,289	3,205,800
Zone 3	15,430	1,662,831

Table 16.--Biological data on the incidental catch of Tanner crab in the foreign and joint venture groundfish fishery in the Bering Sea/ Aleutian Islands region, 1986.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (mm)
Foreign directed fisheries					
Chionoecetes bairdi	10.16	Male	64.45	0.16	71
		Female	35.48	0.11	65
		Unsexed	0.07	0.36	88
		Combined		0.14	69
Chionoecetes opilio	88.16	Male	83.07	0.20	76
		Female	16.75	0.06	54
		Unsexed	0.18	0.11	53
		Combined		0.17	72
Chionoecetes tanneri	0.56	Male	69.81	0.36	108
		Female	29.75	0.13	79
		Unsexed	0.44	0.41	109
		Combined		0.29	99
Chionoecetes angulatus	1.12	Male	61.25	0.27	95
		Female	38.19	0.09	70
		Unsexed	0.56	0.17	82
		Combined		0.20	85
Joint venture fisheries					
Chionoecetes bairdi	7.91	Male	65.00	0.26	86
		Female	34.02	0.10	64
		Unsexed	0.97	0.13	63
		Combined		0.20	79
Chionoecetes opilio	92.08	Male	61.17	0.09	59
		Female	33.83	0.03	45
		Unsexed	5.00	0.06	55
		Combined		0.07	54
Chionoecetes tanneri	<0.01	Male	68.74	0.73	119
		Female	21.95	0.07	56
		Unsexed	9.32	0.20	90
		Combined		0.53	103
Chionoecetes angulatus	0.01	Male	93.49	0.24	78
		Female	4.56	0.20	79
		Unsexed	1.96	0.15	80
		Combined		0.24	78

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986. Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.000	0.000	--	--	--	--
July	--	--	0.000	0.000	--	--	--	--
Aug.	--	--	0.001	0.978	--	--	--	--
Sep.	--	--	0.000	0.000	--	--	--	--
Oct.	--	--	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	<0.001	0.978	--	--	--	--
Japanese Freezer Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	0.027	0.750	--	--	--	--	--	--
July	0.015	0.710	--	--	--	--	--	--
Aug.	0.011	1.031	--	--	--	--	--	--
Sep.	0.018	1.641	--	--	--	--	--	--
Oct.	0.023	1.545	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.016	1.198	--	--	--	--	--	--

* Exclusive Economic Zone

Tab14 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Small Trawler								
Jan.	--	--	--	--	--	--	0.000	0.000
Feb.	--	--	--	--	0.000	0.000	--	--
March	0.000	0.000	0.001	0.500	0.000	0.000	--	--
April	0.000	0.000	0.589	0.733	0.000	0.000	--	--
May	--	--	0.878	0.877	--	--	--	--
June	0.719	1.697	2.824	0.993	--	--	--	--
July	0.144	1.205	0.588	0.868	NS	NS	--	--
Aug.	0.105	2.502	0.422	0.949	0.000	0.000	--	--
Sep.	0.134	2.424	0.625	0.989	--	--	--	--
Oct.	0.041	2.175	0.085	0.993	--	--	--	--
Nov.	0.036	2.806	0.392	0.916	--	--	--	--
Dec.	0.310	2.031	0.090	1.733	0.000	0.000	--	--
Annual	0.129	2.140	0.533	0.937	0.000	0.000	0.000	0.000
Japanese Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	1.435	0.675	0.002	4.500	--	--	--	--
April	--	--	--	--	--	--	--	--
May	0.523	1.711	0.098	1.650	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	0.060	1.937	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.028	2.581	--	--	--	--	--	--
Nov.	0.021	2.189	--	--	--	--	--	--
Dec.	0.011	1.756	--	--	--	--	--	--
Annual	0.043	1.628	0.003	3.075	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Surimi Large Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	0.000	0.000	--	--	--	--
Aug.	0.000	0.000	0.000	0.000	--	--	--	--
Sep.	0.021	1.049	0.000	0.000	--	--	--	--
Oct.	0.062	2.344	0.009	1.670	--	--	--	--
Nov.	0.000	0.000	0.000	0.000	--	--	--	--
Dec.	--	--	0.000	0.000	--	--	0.000	0.000
Annual	0.020	1.793	<0.001	1.670	--	--	0.000	0.000
Japanese Longliners Fishing <500 M								
Jan.	--	--	0.000	0.000	--	--	--	--
Feb.	NS	NS	0.000	0.000	--	--	--	--
March	--	--	0.000	0.000	--	--	--	--
April	--	--	0.014	1.193	--	--	--	--
May	--	--	0.000	0.000	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	0.000	0.000	--	--	--	--
Sep.	--	--	0.000	0.000	--	--	--	--
Oct.	--	--	0.004	1.460	--	--	--	--
Nov.	--	--	0.001	1.667	--	--	--	--
Dec.	NS	NS	0.013	1.264	--	--	--	--
Annual	NS	NS	0.003	1.329	--	--	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 Continued. Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	0.000	0.000	--	--	0.000	0.000
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	0.000	0.000	--	--
Nov.	0.000	0.000	--	--	0.000	0.000	--	--
Dec.	--	--	--	--	NS	NS	--	--
Annual	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Republic of Korea Small Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	0.000	0.000	--	--
March	--	--	NS	NS	NS	NS	0.000	0.000
April	--	--	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--	--	--
June	0.014	1.290	--	--	--	--	--	--
July	NS	NS	--	--	--	--	--	--
Aug.	0.001	2.700	--	--	--	--	--	--
Sep.	0.036	2.283	--	--	--	--	--	--
Oct.	0.116	2.191	--	--	--	--	--	--
Nov.	0.000	0.000	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.024	2.011	NS	NS	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Republic of Korea Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April	0.000	0.000	--	--	--	--	--	--
May	0.018	1.560	--	--	--	--	0.000	0.000
June	0.001	2.492	--	--	--	--	--	--
July	<0.001	1.300	0.000	0.000	--	--	--	--
Aug.	0.003	2.614	0.000	0.000	--	--	--	--
Sep.	0.008	2.350	0.008	1.800	--	--	--	--
Oct.	0.016	2.172	--	--	--	--	--	--
Nov.	0.004	1.691	--	--	--	--	--	--
Dec.	NS	NS	--	--	--	--	--	--
Annual	0.006	2.153	<0.001	1.800	0.000	0.000	0.000	0.000
Peoples Republic of China Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	NS	NS	NS	NS	--	--	--	--
March	--	--	0.000	0.000	0.000	0.000	--	--
April	--	--	--	--	--	--	--	--
May	0.679	1.434	--	--	--	--	0.000	0.000
June	0.102	1.348	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	0.000	0.000	--	--	--	--	--	--
Dec.	0.000	0.000	--	--	--	--	--	--
Annual	0.196	1.413	0.000	0.000	0.000	0.000	0.000	0.000

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-U.S.S.R JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	0.001	1.660	--	--	--	--	--	--
March	0.005	1.541	NS	NS	--	--	--	--
April	0.172	1.375	NS	NS	0.000	0.000	--	--
May	1.771	1.103	--	--	0.021	0.819	--	--
June	0.022	1.567	0.000	0.000	0.002	0.856	--	--
July	0.045	0.914	--	--	0.000	0.000	--	--
Aug.	0.102	2.072	--	--	--	--	--	--
Sep.	0.715	1.579	--	--	--	--	--	--
Oct.	0.100	2.604	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.507	1.162	0.000	0.000	0.007	0.822	--	--
U.S.-Republic of Korea JV Mothership								
Jan.	0.000	0.000	--	--	--	--	--	--
Feb.	0.008	1.417	--	--	0.000	0.000	--	--
March	0.186	0.863	--	--	--	--	--	--
April	0.227	1.290	--	--	0.000	0.000	--	--
May	0.589	1.315	--	--	0.108	0.461	--	--
June	0.002	1.778	--	--	0.163	0.012	--	--
July	0.057	1.819	0.002	0.793	0.004	0.646	--	--
Aug.	0.751	1.599	0.000	0.000	0.000	0.000	--	--
Sep.	0.242	1.546	0.000	0.000	--	--	--	--
Oct.	1.591	1.277	--	--	--	--	--	--
Nov.	0.390	1.528	--	--	--	--	--	--
Dec.	0.147	1.801	--	--	--	--	--	--
Annual	0.391	1.319	0.001	0.793	0.065	0.184	--	--

* Exclusive Economic Zone

NS = Fishing occurred but no sampling by U.S. observers.

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	0.000	0.000	--	--	0.000	0.000	--	--
March	<0.001	0.920	--	--	--	--	--	--
April	0.047	1.541	0.000	0.000	--	--	--	--
May	1.306	1.252	--	--	--	--	--	--
June	0.016	1.957	0.000	0.000	0.000	0.000	--	--
July	0.001	1.866	0.000	0.000	--	--	--	--
Aug.	0.115	1.375	0.001	0.383	--	--	--	--
Sep.	0.043	2.054	0.000	0.000	--	--	--	--
Oct.	0.966	1.430	--	--	--	--	--	--
Nov.	0.020	2.221	--	--	--	--	--	--
Dec.	0.000	0.000	--	--	--	--	--	--
Annual	0.179	1.381	<0.001	0.383	0.000	0.000	--	--
U.S.-Poland JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.044	1.550	--	--	--	--	--	--
April	0.005	1.905	--	--	--	--	--	--
May	0.182	1.188	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	0.000	0.000	--	--	--	--	--	--
Oct.	0.733	1.692	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.111	1.545	--	--	--	--	--	--

* Exclusive Economic Zone

Table 17.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture groundfish catches in the Bering Sea, 1986 (Continued). Lines indicate areas not fished.

	Area I		Area II		Area IV		Outside EEZ*	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	0.000	0.000	--	--	--	--	--	--
April	0.284	1.530	--	--	--	--	--	--
May	0.275	1.755	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
Aug.	--	--	--	--	--	--	--	--
Sep.	--	--	--	--	--	--	--	--
Oct.	0.561	1.678	--	--	--	--	--	--
Nov.	0.085	2.166	--	--	--	--	--	--
Dec.	0.057	2.176	--	--	--	--	--	--
Annual	0.185	1.612	--	--	--	--	--	--

* Exclusive Economic Zone

Table 18.--Estimated incidental catches of king crab (in numbers of crab and metric tons) by foreign groundfish and joint venture vessels in the Bering Sea/Aleutian region, 1986.

	Number of crab					Weight (metric tons)				
	Area I	Area II	Area III	Area IV	Total all areas	Area I	Area II	Area III	Area IV	Total all areas
Foreign groundfish vessels										
Japan										
SMS	-	34	-	-	34	-	0.03	-	-	0.03
FMS	542	-	-	-	542	0.64	-	-	-	0.64
SST	2,913	9,560	-	0	12,473	6.18	8.99	-	0.00	15.17
LST	173	7	-	-	180	0.35	0.01	-	-	0.36
LFT	260	3	-	-	263	0.44	0.01	-	-	0.45
LL	2	97	-	-	99	<0.01	0.13	-	-	0.13
Republic of Korea (ROK)										
SST	238	0	-	0	238	0.49	0.00	-	0.00	0.49
LFT	463	0	-	0	463	0.99	0.00	-	0.00	0.99
Poland										
LFT	0	-	-	0	0	0.00	-	-	0.00	0.00
Peoples Republic of China (PRC)										
LFT	339	0	-	0	339	0.48	0.00	-	0.00	0.48
All nations total	4,930	9,701	-	0	14,631	9.57	9.17	-	0.00	18.74
Percent by area	33.70	66.30	-	0.00		51.07	48.93	-	0.00	
Joint venture vessels										
U.S.-Japan	49,253	55	-	0	49,308	68.48	0.02	-	0.00	68.50
U.S.-ROK	116,683	21	-	3,200	119,904	153.94	0.02	-	0.61	154.57
U.S.-Poland	841	-	-	0	841	1.32	-	-	0.00	1.32
U.S.-PRC	1,454	-	-	-	1,454	2.36	-	-	-	2.36
U.S.-U.S.S.R.	88,807	0	-	121	88,928	105.30	-	-	0.10	105.40
Joint venture totals	257,038	76	-	3,321	260,435	331.40	0.04	-	0.71	332.15
Percent by area	98.70	0.03	-	1.27		99.77	0.01	-	0.22	

SMS = Surimi motherships
FMS = Freezer motherships
SST = Small stern trawler
LST = Large surimi trawler
LFT = Large freezer trawler
LL = Longliner

Table 19.--Estimated incidental catches (numbers and metric tons) of king crab (Lithodes and Paralithodes spp.) in the foreign and joint venture groundfish fisheries in the Bering Sea/Aleutian Islands region, 1977-86*.

Year	Foreign		Joint Venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	599,623	641	NF	NF	599,623	641
1978	1,277,931	1,097	NF	NF	1,277,931	1,097
1979	1,007,796	1,008	NF	NF	1,007,796	1,008
1980	858,129	781	289,542	241	1,147,671	1,022
1981	733,026	666	1,084,126	642	1,817,152	1,308
1982	380,004	343	193,915	90	573,919	433
1983	404,013	353	630,144	337	1,034,157	690
1984	292,223	309	398,865	283	691,088	592
1985	219,783	191	1,005,290	678	1,225,073	869
1986	14,631	19	260,435	332	275,066	351

* Estimated catches for years 1977-85 from Berger et al. 1987.

NF = no fishing.

Table 20.--Catches of king crab by species and zone made by the yellowfin sole/ flatfish joint venture fishery, 1986.

	Red king crab	Blue king crab	Other king crab
Zone 1	126,864	4	1,726
Zone 2	3,931	6,666	6
Zone 3	3,983	568	17

Table 21.--Biological data on the incidental catch of king crab in the foreign and joint venture groundfish fishery in the Bering Sea/ Aleutian Islands region, 1986.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (mm)
Foreign directed fisheries					
Blue	14.49	Male	47.81	2.31	146
		Female	50.84	1.81	156
		Unsexed	1.35	1.38	121
		Combined		2.05	151
Red	62.96	Male	79.75	1.94	139
		Female	19.76	0.97	117
		Unsexed	0.49	0.72	97
		Combined		1.74	134
Golden	22.08	Male	41.65	1.21	138
		Female	57.21	0.73	108
		Unsexed	1.14	0.76	115
		Combined		0.93	121
Couesi	0.46	Male	56.43	0.65	113
		Female	43.57	1.04	132
		Unsexed	0.00	--	--
		Combined		0.82	121
Joint venture fisheries					
Blue	3.31	Male	55.78	1.57	114
		Female	44.19	0.82	105
		Unsexed	0.02	0.25	77
		Combined		1.24	110
Red	95.50	Male	88.75	1.43	130
		Female	10.31	0.74	100
		Unsexed	0.95	1.67	138
		Combined		1.37	127
Golden	1.19	Male	49.02	0.12	52
		Female	50.91	0.31	69
		Unsexed	0.06	0.38	91
		Combined		0.22	61

Table 22. --The common and scientific names of rockfish identified in the 1986 foreign and joint venture catches in the Bering Sea/Aleutian Islands region.

Common name[a]	Scientific name
Darkblotched rockfish	Sebastes crameri
Dusky rockfish	Sebastes ciliatus
Northern rockfish	Sebastes polyspinis
Pacific ocean perch	Sebastes alutus
Redstripe rockfish	Sebastes proriger
Rougheye rockfish	Sebastes aleutianus
Shortraker rockfish	Sebastes borealis
Shortspine thornyhead	Sebastolobus alascanus
Silvergray rockfish	Sebastes brevispinis
Other rockfish[b]	
Black rockfish	Sebastes melanops
Blue rockfish	Sebastes mystinus
Bocaccio	Sebastes paucispinis
Greenstriped rockfish	Sebastes elongatus
Harlequin rockfish	Sebastes variegatus
Longspine thornyhead	Sebastelobus altivelis
Redbanded rockfish	Sebastes babcocki
Splitnose rockfish	Sebastes diploproa
Widow rockfish	Sebastes entomelas

[a] With all rockfish, the possibility of misidentification exists, and the listing of species not previously reported from the Bering Sea/Aleutian Islands region should be noted with caution.

[b] The 9 species listed under "Other rockfish" each made up less than 0.10% of the rockfish catch by foreign vessels.

Table 23.--Estimated catch of rockfish by species and area in the Bering Sea/Aleutian Island region during 1986.

Common name	Area I t	Area I %	Area II t	Area II %	Area IV t	Area IV %	Total t	Total %
Foreign directed fisheries								
Dark blotched rockfish	0.19	1.94	0.10	0.38	0.00	0.00	0.29	0.81
Dusky rockfish	1.33	13.60	1.49	5.74	0.03	37.50	2.85	7.95
Northern rockfish	3.51	35.89	2.00	7.70	0.01	12.50	5.52	15.40
Pacific ocean perch	3.96	40.49	12.52	48.19	0.03	37.50	16.51	46.07
Redstripe rockfish	0.01	0.10	0.07	0.27	0.00	0.00	0.08	0.22
Rougheye rockfish	0.25	2.56	7.26	27.94	0.01	12.50	7.52	20.98
Shortraker rockfish	0.03	0.31	1.76	6.77	0.00	0.00	1.79	4.99
Shortspine thornyhead	0.50	5.11	0.60	2.31	0.00	0.00	1.10	3.07
Silvergray rockfish	0.00	0.00	0.14	0.54	0.00	0.00	0.14	0.39
Other rockfish*	<0.01	<0.01	0.04	0.15	<0.01	<0.01	0.04	0.11
Total	9.78		25.99		0.09		35.86	
Percent by area	27.29		72.49		0.22			
Joint venture fisheries								
Dark blotched rockfish	<0.01	<0.01	0.00	0.00	6.95	1.84	6.95	1.28
Dusky rockfish	9.98	6.50	0.54	3.96	6.84	1.81	17.36	3.19
Northern rockfish	24.27	15.81	11.65	85.35	199.95	52.94	235.87	43.29
Pacific ocean perch	116.46	75.87	0.70	5.13	160.20	42.41	277.36	50.90
Redstripe rockfish	<0.01	<0.01	0.70	5.13	1.41	0.37	2.11	0.39
Rougheye rockfish	1.02	0.66	0.01	0.07	2.18	0.58	3.21	0.59
Shortraker rockfish	1.50	0.98	0.00	0.00	<0.01	<0.01	1.50	0.28
Silvergray rockfish	0.02	0.01	0.00	0.00	0.00	0.00	0.02	<0.01
Other rockfish*	0.24	0.16	0.05	0.37	0.19	0.05	0.48	0.09
Total	153.48		13.64		377.71		544.83	
Percent by area	28.17		2.51		69.32			

* Species included in this category are listed in Table 22.

Table 24.--The common and scientific names of flatfish identified in the 1986 foreign and joint venture catches in the Bering Sea/Aleutian Islands region.

Common name	Scientific name
Alaska plaice	*Pleuronectes quadrituberculatus*
Arrowtooth flounder (turbot)	*Atheresthes stomias*
Bering flounder	*Hippoglossoides robustus*
Butter sole	*Isopsetta isolepis*
Curlfin sole	*Pleuronichthys decurrens*
Deepsea sole	*Embassichthys bathybius*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Flathead sole	*Hippoglossoides elassodon*
Greenland turbot	*Reinhardtius hippoglossoides*
Hybrid sole	*Inopsetta ischyra*
Kamchatka flounder	*Atheresthes evermanni*
Longhead dab	*Limanda proboscidea*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Rock sole	*Lepidopsetta bilineata*
Roughscale sole	*Clidoderma asperrimum*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*
Yellowfin sole	*Limanda aspera*

Table 25.--Estimated catch of flatfish by species and area in the Bering Sea/Aleutian Islands region during 1986.

Common name	Area I t	Area I %	Area II t	Area II %	Area IV t	Area IV %	Total t	Total %
Foreign directed fisheries								
Alaska plaice	4,941.00	7.63	224.95	1.72	9.61	6.76	5,175.56	6.64
Arrowtooth flounder	953.12	1.47	2,166.52	16.61	0.10	0.07	3,119.74	4.00
Bering flounder	1.95	<0.01	3.95	0.03	0.01	0.01	5.91	0.01
Butter sole	0.02	<0.01	0.00	0.00	0.00	0.00	0.02	<0.01
Curlfin sole	0.01	<0.01	0.00	0.00	0.00	0.00	0.01	<0.01
Deepsea sole	0.50	<0.01	0.03	<0.01	<0.01	<0.01	0.53	<0.01
Dover sole	0.35	<0.01	0.11	<0.01	0.01	0.01	0.47	<0.01
Flathead sole	1,124.40	1.74	594.26	4.56	27.41	19.27	1,746.07	2.24
Greenland turbot	438.04	0.68	6,356.82	48.73	98.63	69.34	6,893.49	8.84
Kamchatka flounder	32.98	0.05	309.26	2.37	0.00	0.00	342.24	0.44
Longhead dab	3.61	0.01	0.00	0.00	0.00	0.00	3.61	<0.01
Petrale sole	1.34	<0.01	0.24	<0.01	0.01	0.01	1.59	<0.01
Rex sole	25.30	0.04	26.33	0.20	2.16	1.52	53.79	0.07
Rock sole	3,276.92	5.06	112.92	0.87	4.29	3.02	3,394.13	4.35
Roughscale sole	0.00	0.00	0.13	<0.01	0.01	0.01	0.14	<0.01
Starry flounder	30.88	0.05	0.31	<0.01	0.01	0.01	31.20	0.04
Yellowfin sole	53,946.60	83.28	3,250.26	24.91	0.00	0.00	57,196.86	73.36
Total	64,777.01		13,046.09		142.24		77,965.34	
Percent by area	83.08		16.73		0.18			
Joint venture fisheries								
Alaska plaice	41,119.93	19.05	223.45	37.24	0.10	0.03	41,343.48	19.07
Arrowtooth flounder	3,163.18	1.47	80.88	13.48	76.52	21.83	3,320.58	1.53
Bering flounder	69.89	0.03	0.66	0.11	0.00	0.00	70.55	0.03
Butter sole	27.18	0.01	0.00	0.00	0.00	0.00	27.18	0.01
Deepsea sole	0.03	<0.01	0.00	0.00	0.00	0.00	0.03	<0.01
Dover sole	3.60	<0.01	<0.01	<0.01	0.02	0.01	3.62	<0.01
English sole	6.04	<0.01	0.00	0.00	0.00	0.00	6.04	<0.01
Flathead sole	3,302.28	1.53	82.40	13.73	0.80	0.23	3,385.48	1.56
Greenland turbot	22.95	0.01	6.11	1.02	6.59	1.88	35.65	0.02
Hybrid sole	1.79	<0.01	0.00	0.00	0.00	0.00	1.79	<0.01
Kamchatka flounder	48.55	0.02	5.23	0.87	1.05	0.30	54.83	0.03
Longhead dab	110.81	0.05	0.00	0.00	0.00	0.00	110.81	0.05
Petrale sole	5.91	<0.01	0.00	0.00	0.00	0.00	5.91	<0.01
Rex sole	333.06	0.15	2.02	0.34	0.05	0.01	335.13	0.15
Rock sole	15,916.01	7.37	36.04	6.01	265.32	75.71	16,217.37	7.48
Sand sole	0.11	<0.01	0.00	0.00	0.00	0.00	0.11	<0.01
Starry flounder	535.79	0.25	0.01	<0.01	0.00	0.00	535.80	0.25
Yellowfin sole	151,236.62	70.05	163.23	27.20	0.00	0.00	151,399.85	69.82
Total	215,903.73		600.03		350.45		216,854.21	
Percent by area	99.56		0.28		0.16			

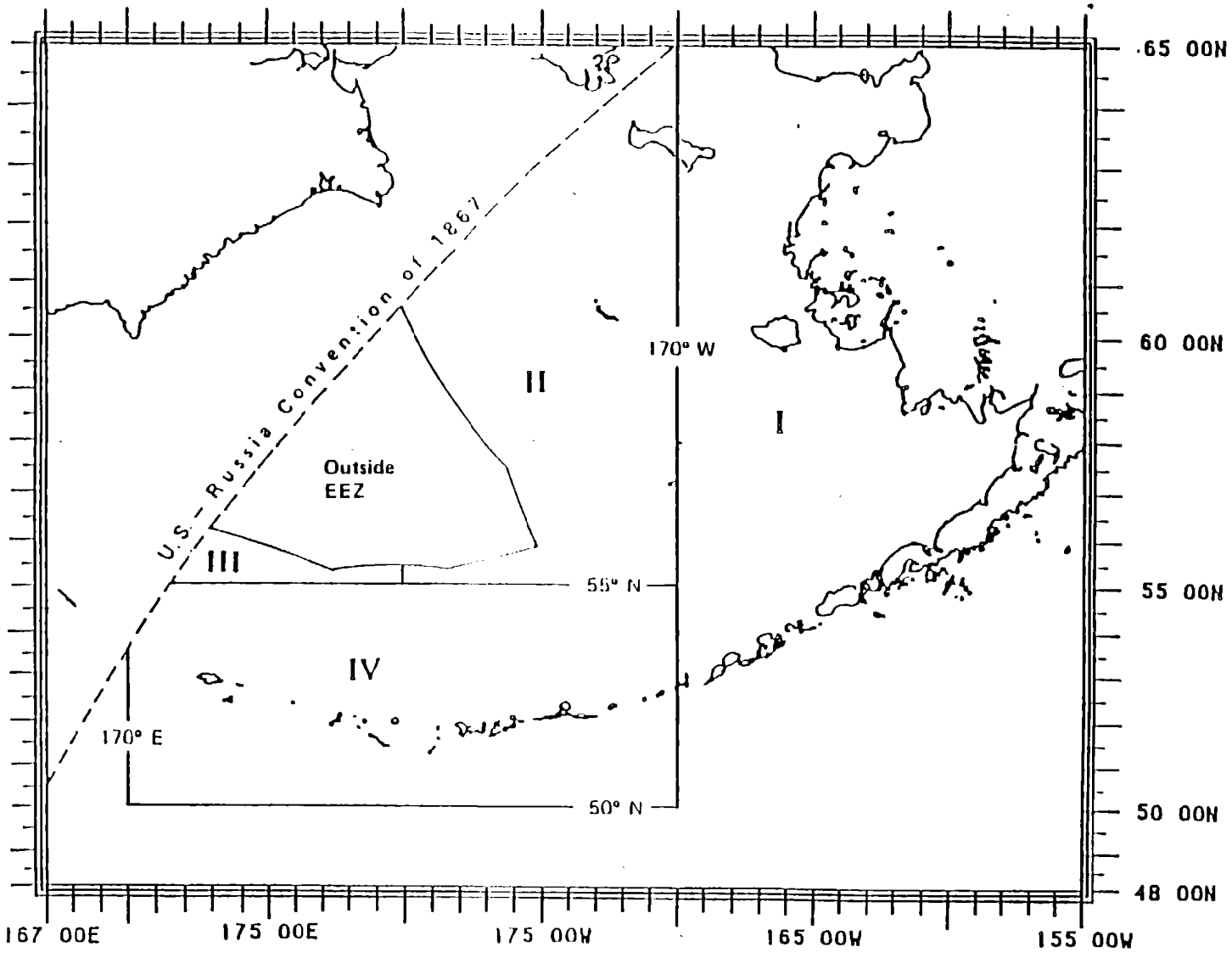


Figure 1.--U.S. statistical areas in the Bering Sea/Aleutian Islands region used to summarize catch and effort data.

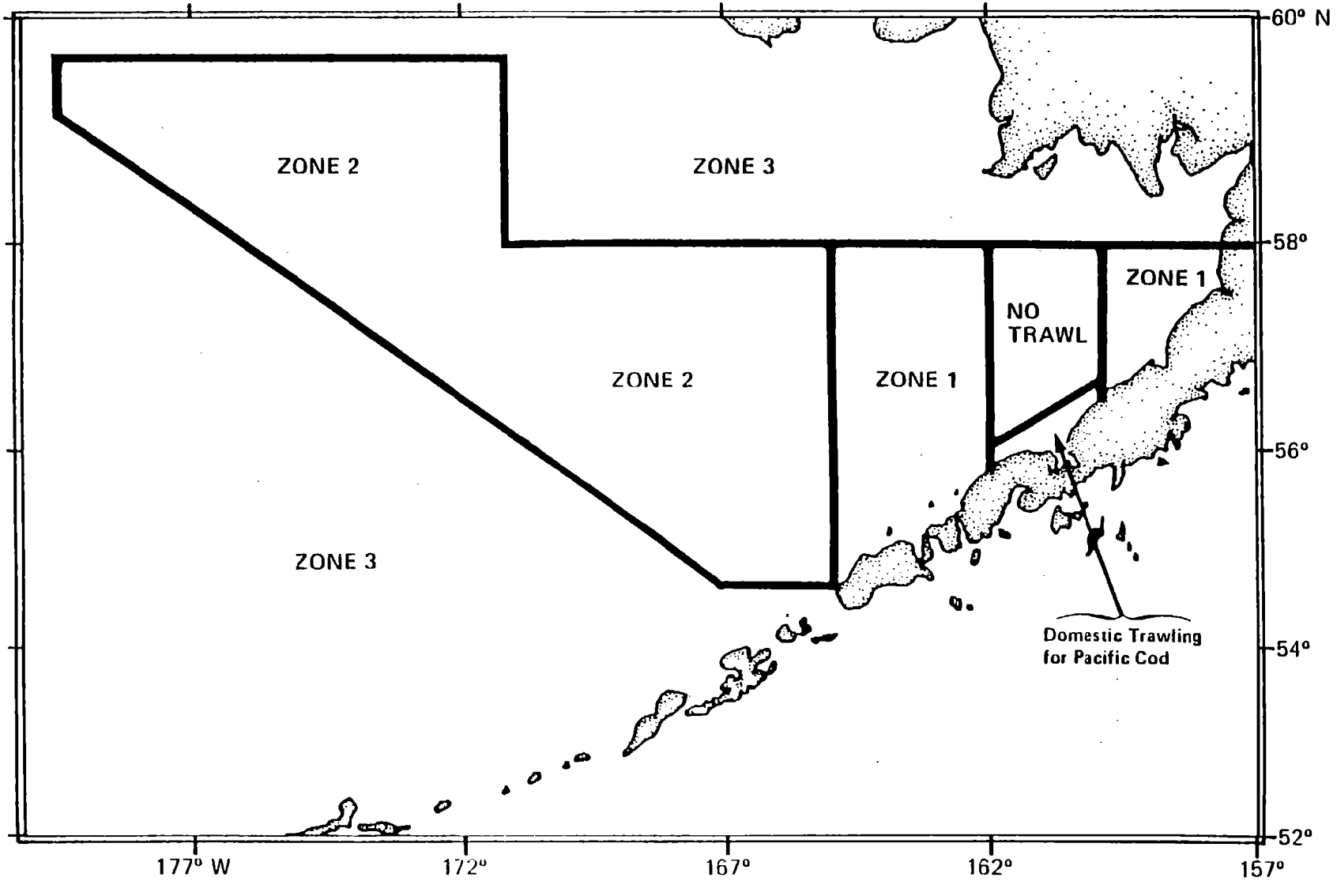
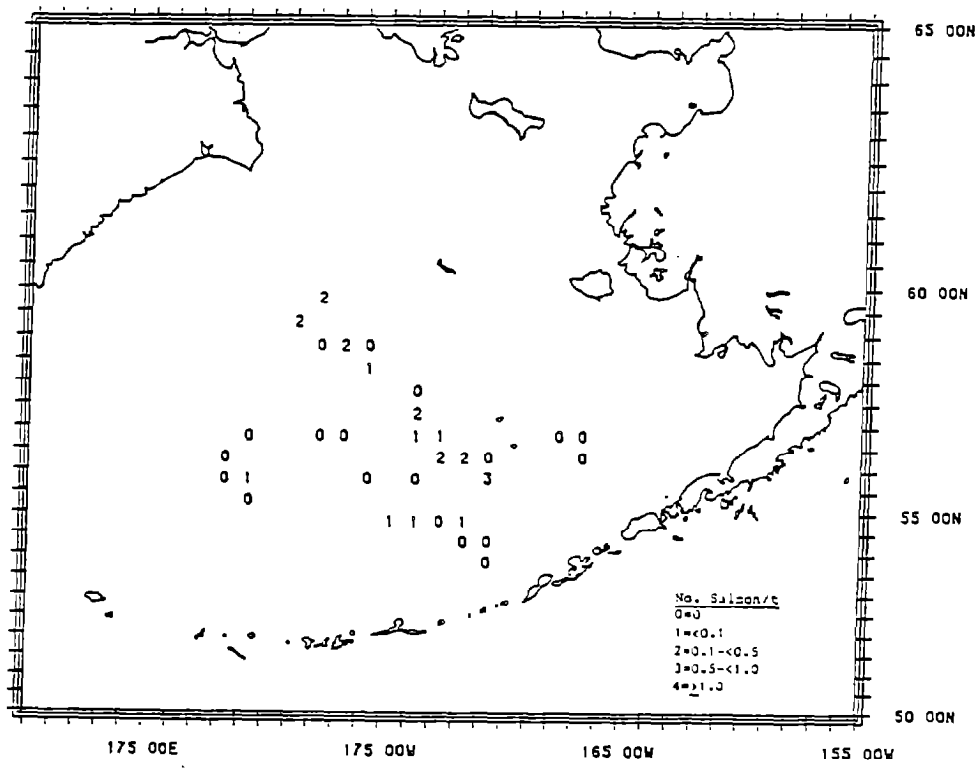
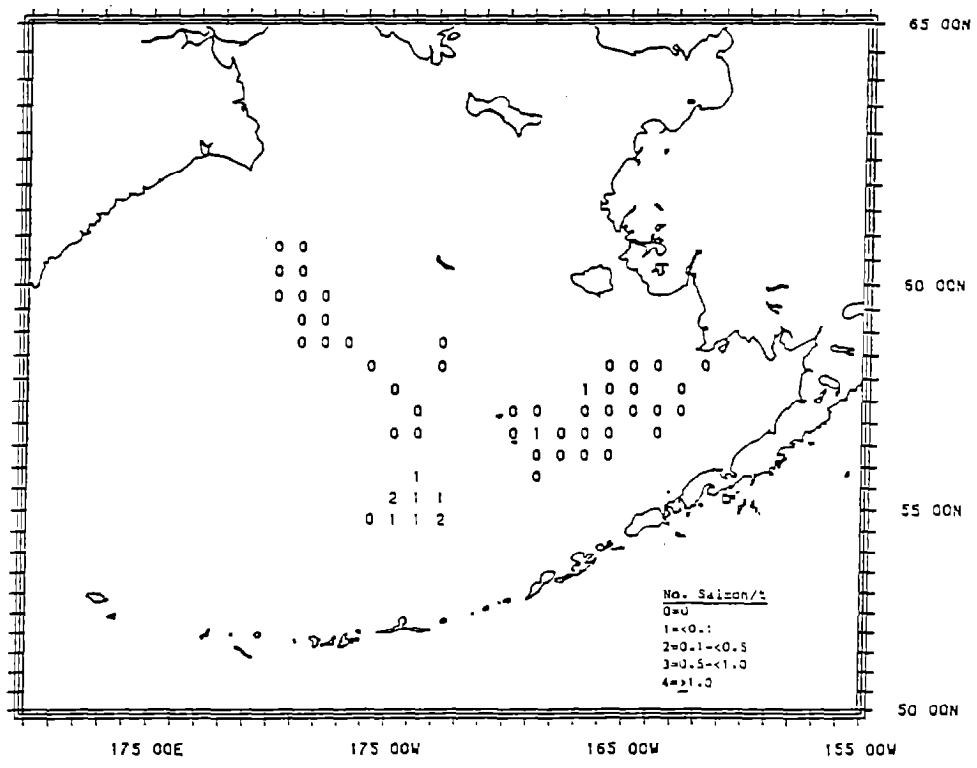


Figure 2.--U.S. zones in the Bering Sea/Aleutian Islands region, 1986.

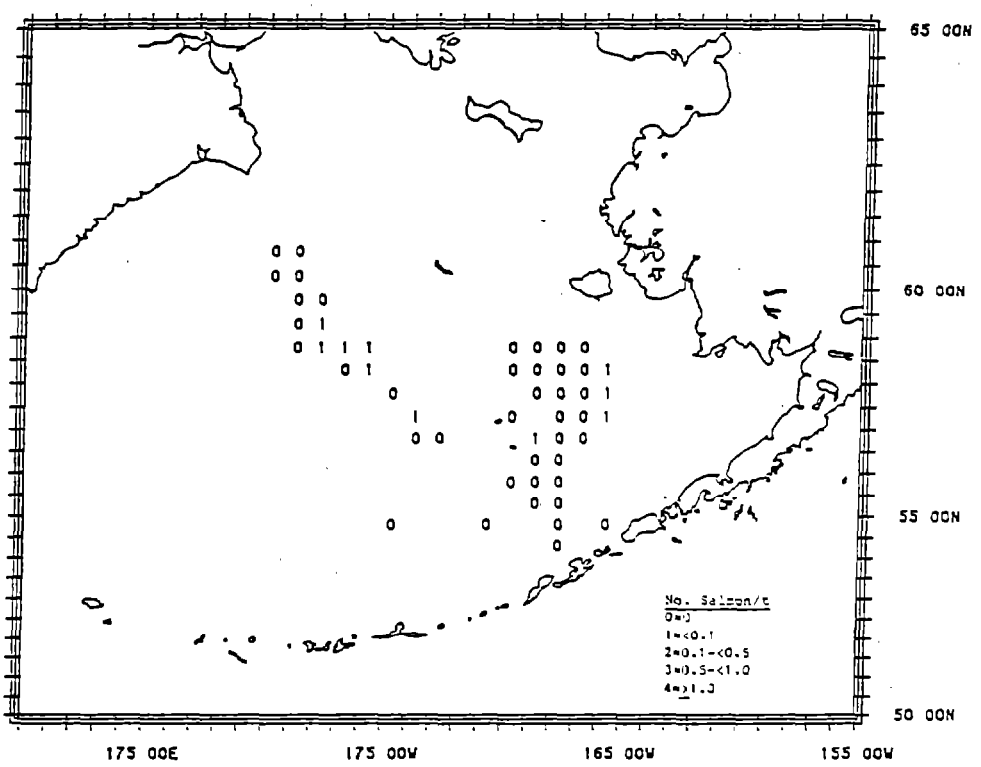


SALMON INCIDENCE 1986 FIRST QUARTER SMALL STERN TRAWLERS

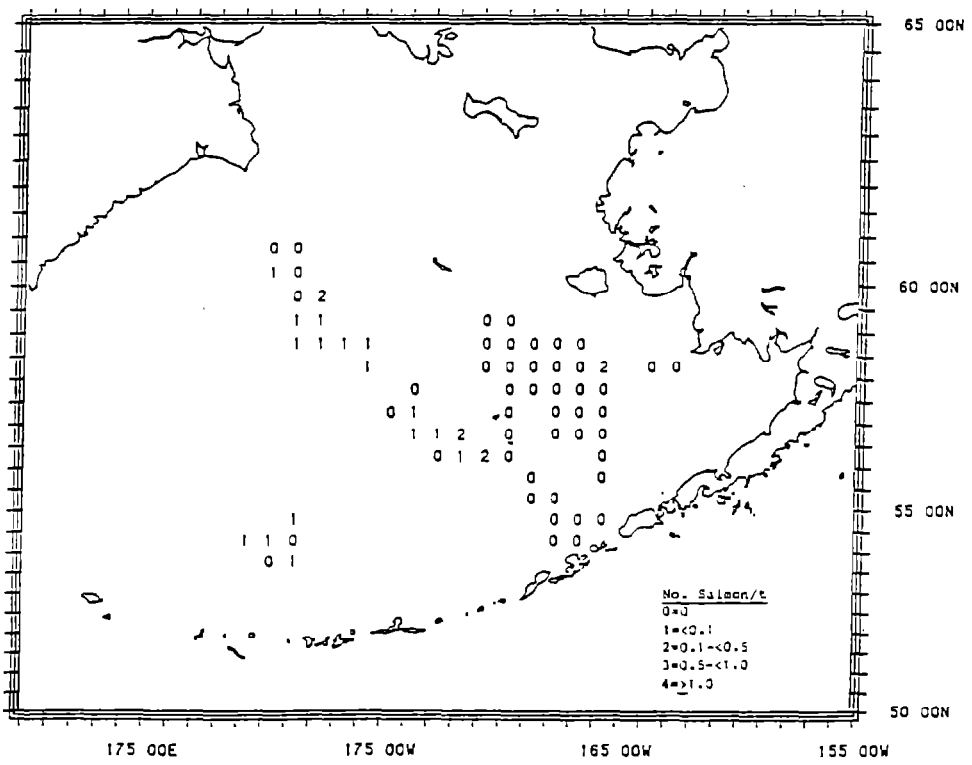


SALMON INCIDENCE 1986 SECOND QUARTER SMALL STERN TRAWLERS

Figure 3.--Average incidence (no./t) of salmon on small stern trawlers (a11 nations) by quarter and $1/2^{0}$ lat. by 1^{o} long. areas, 1986.

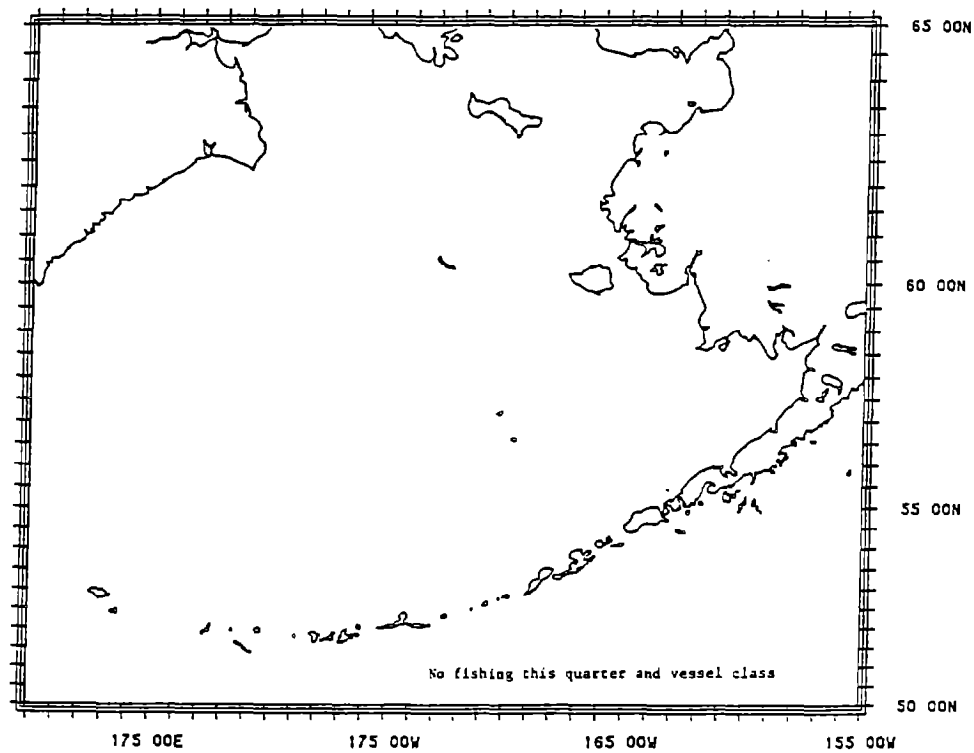


SALMON INCIDENCE 1986 THIRD QUARTER SMALL STERN TRAWLERS



SALMON INCIDENCE 1986 FOURTH QUARTER SMALL STERN TRAWLERS

Figure 3. --Continued.



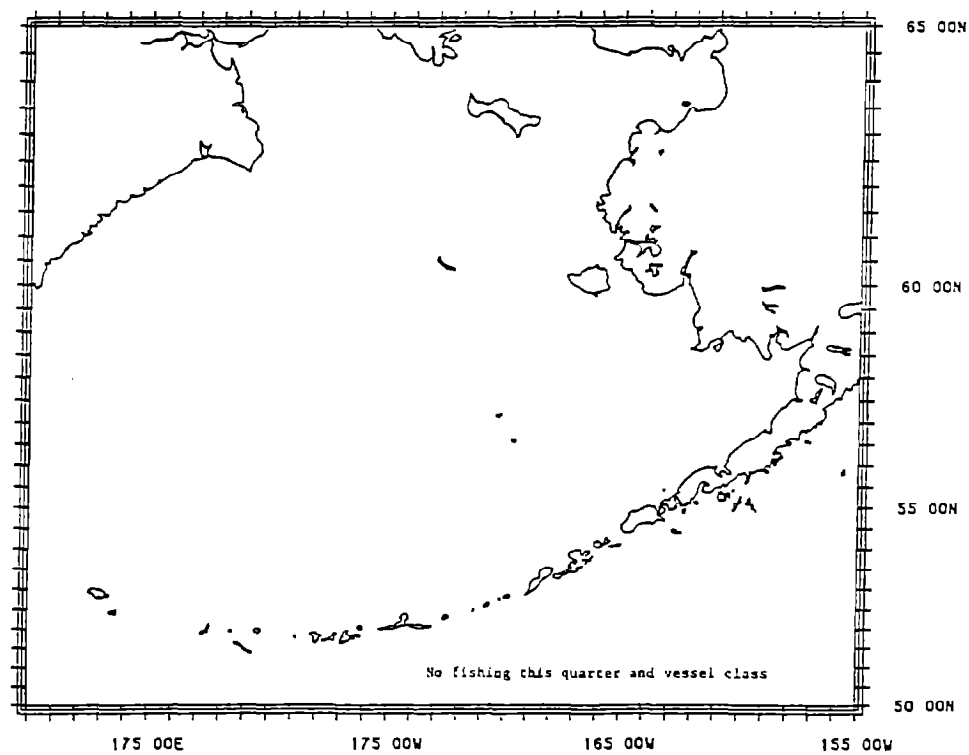
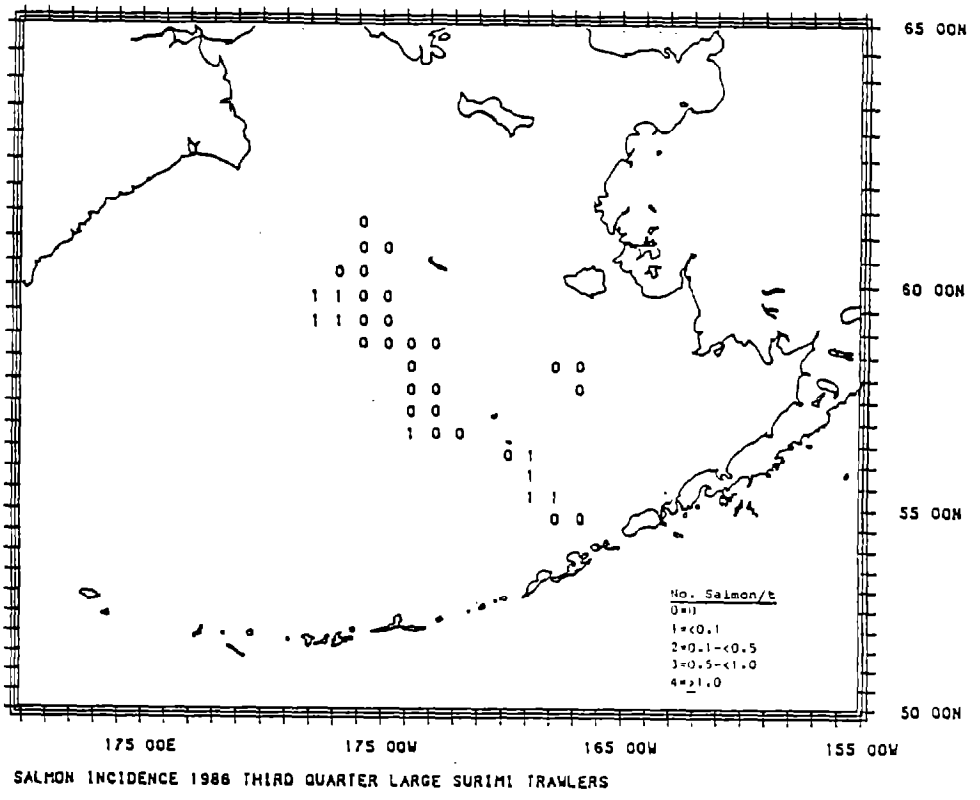
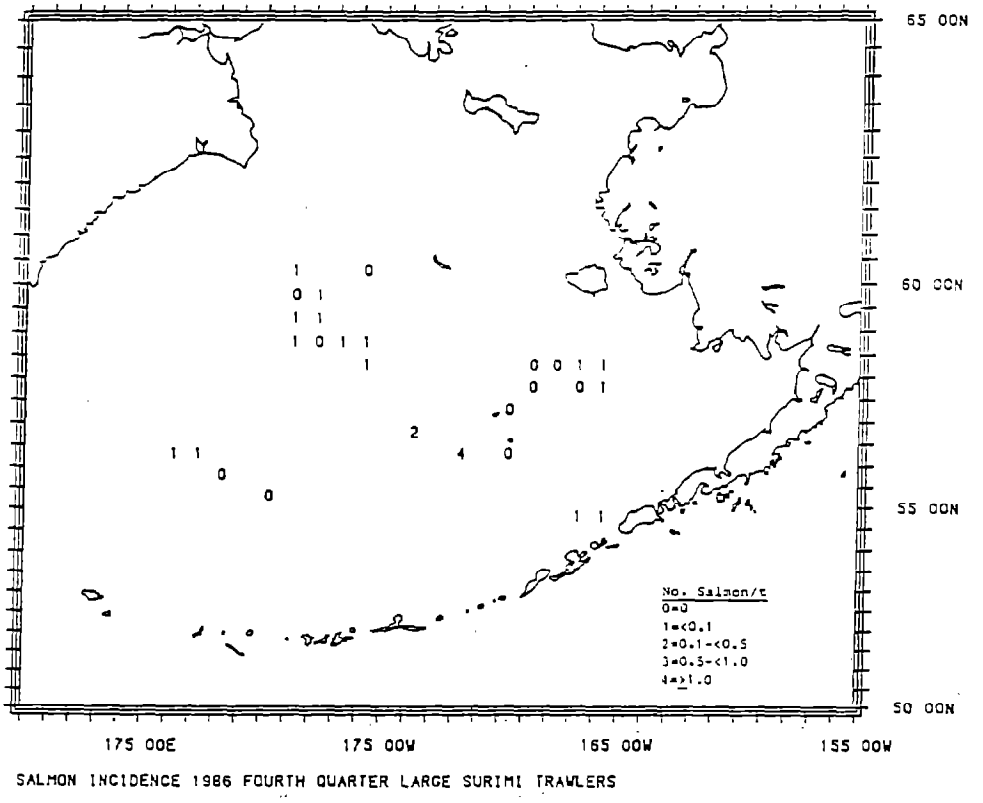


Figure 4. --Average incidence (no./t) of salmon, on surimi trawlers (all nations) by quarter and l/2° lat. by l° long. areas, 1986.

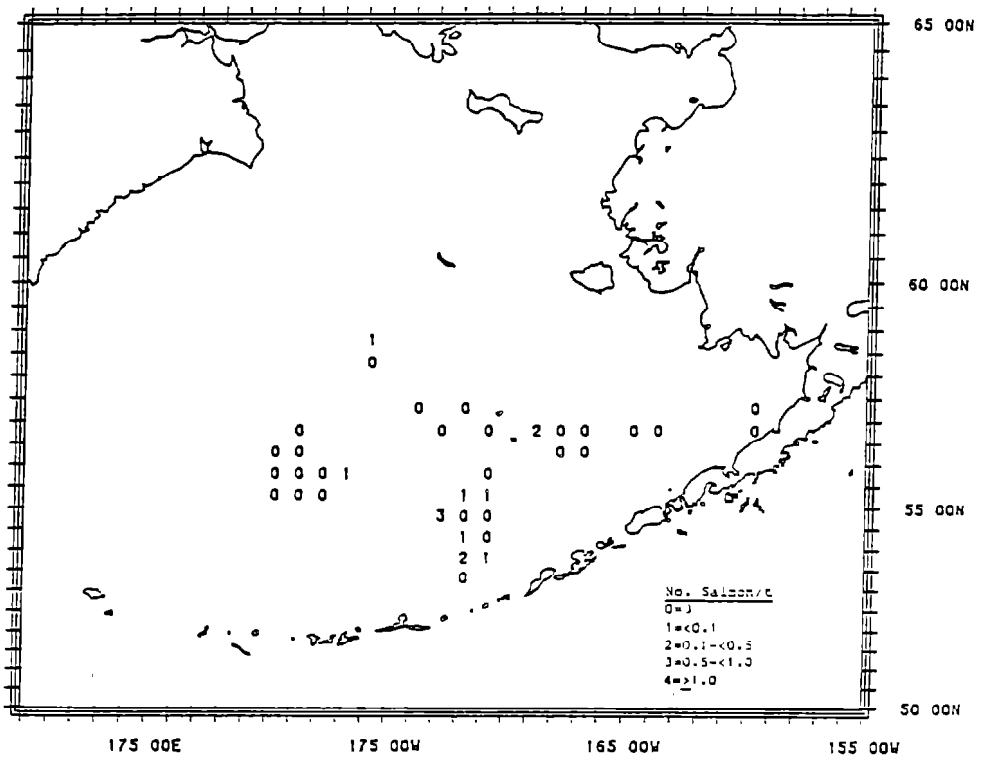


SALMON INCIDENCE 1986 THIRD QUARTER LARGE SURIMI TRAWLERS

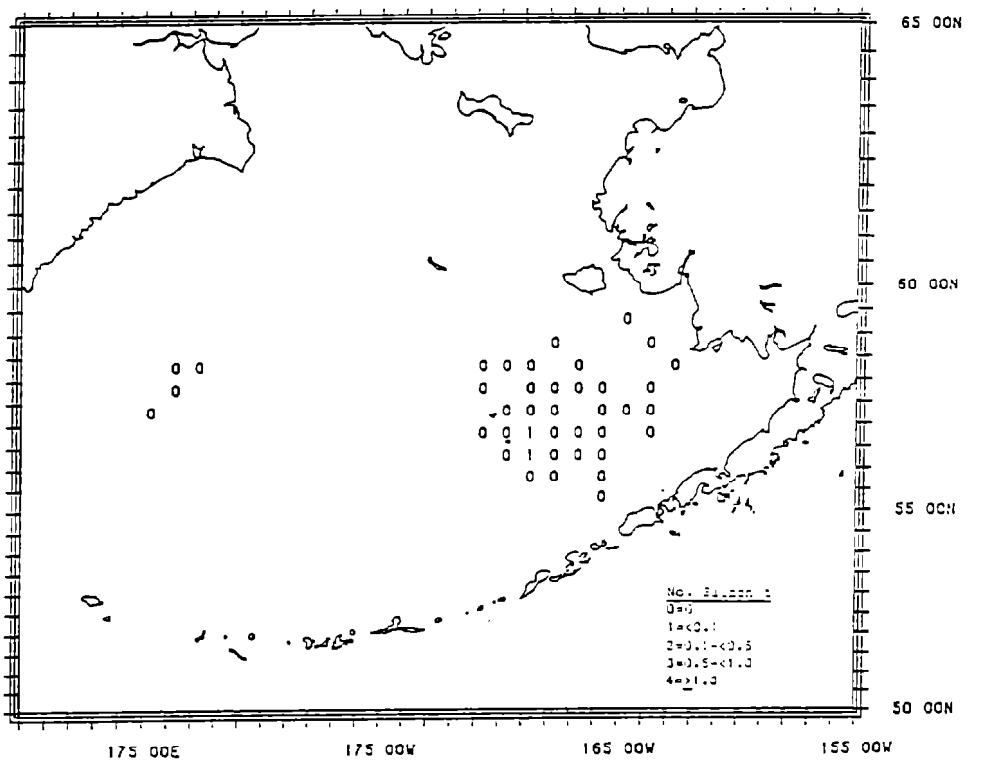


SALMON INCIDENCE 1986 FOURTH QUARTER LARGE SURIMI TRAWLERS

Figure 4.--Continued.

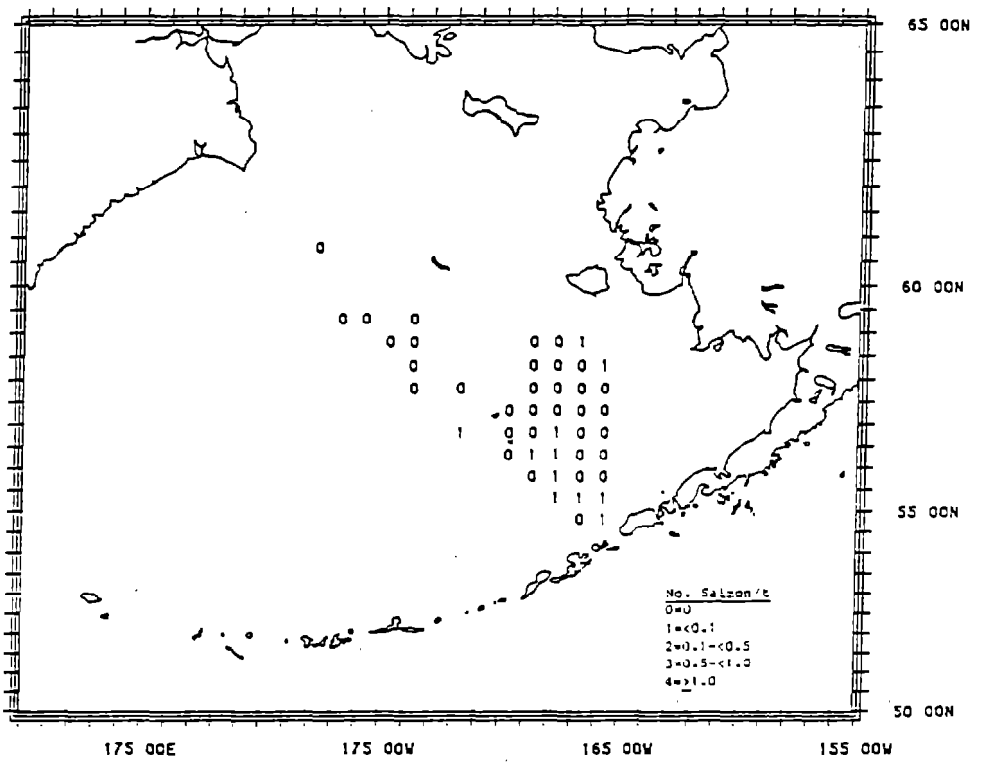


SALMON INCIDENCE 1986 FIRST QUARTER LARGE FREEZER TRAWLERS

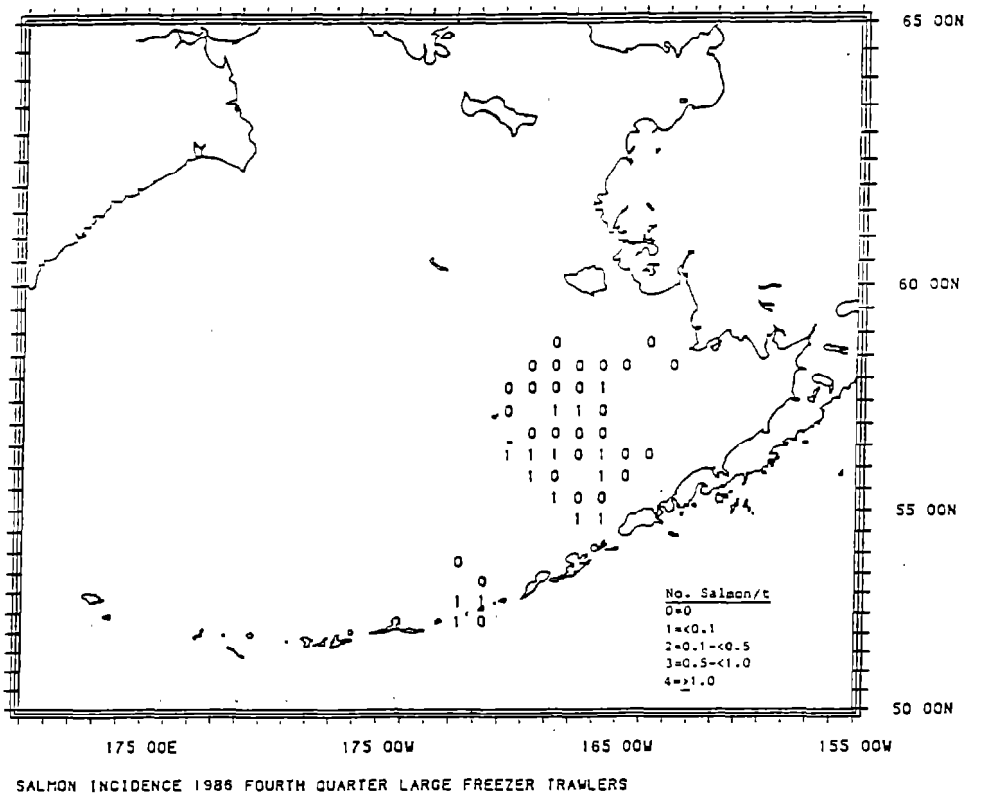


SALMON INCIDENCE 1986 SECOND QUARTER LARGE FREEZER TRAWLERS

Figure 5.--Average incidence (no./t) of salmon on large freezer trawlers (all nations) by quarter and l/2° lat. by l° long. areas, 1986.

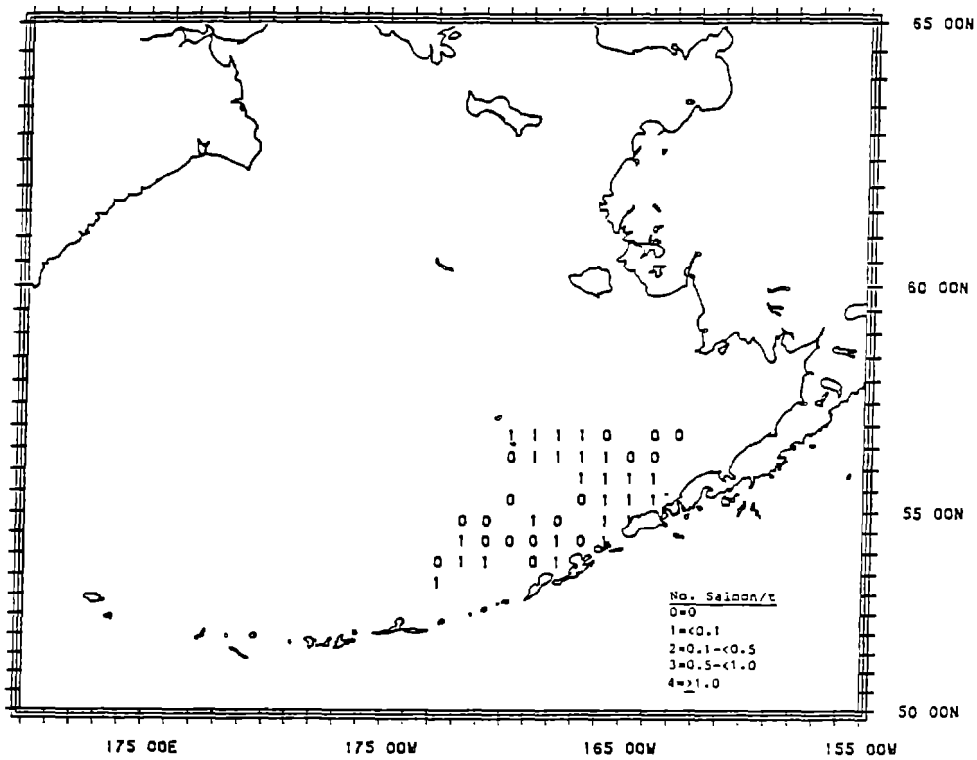


SALMON INCIDENCE 1986 THIRD QUARTER LARGE FREEZER TRAWLERS

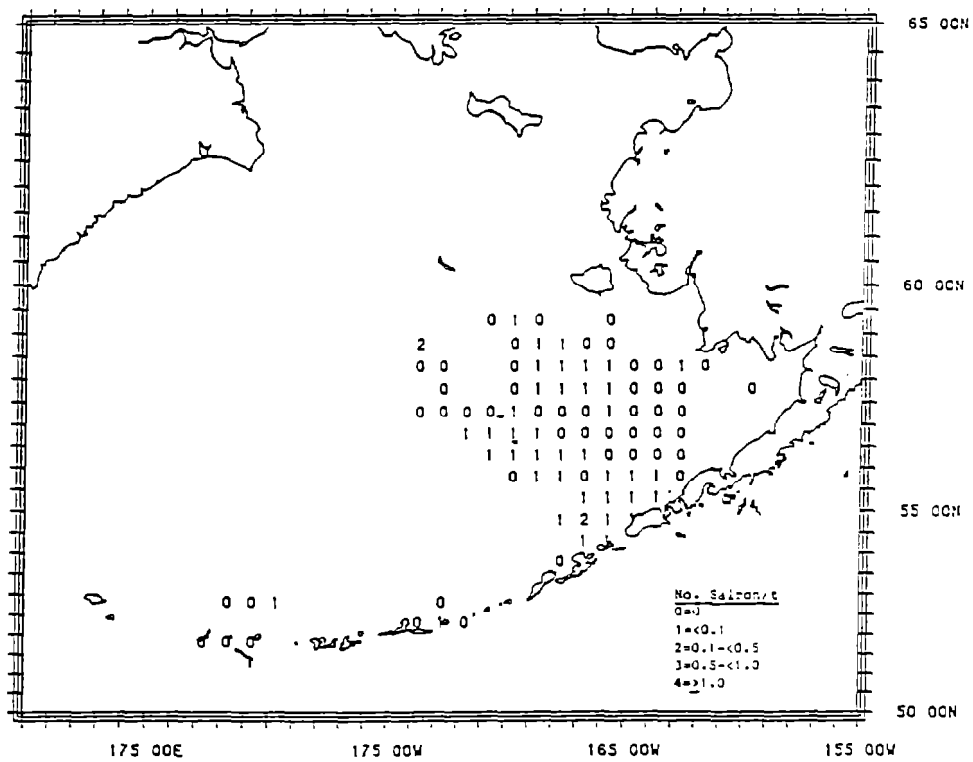


SALMON INCIDENCE 1986 FOURTH QUARTER LARGE FREEZER TRAWLERS

Figure 5. --Continued.

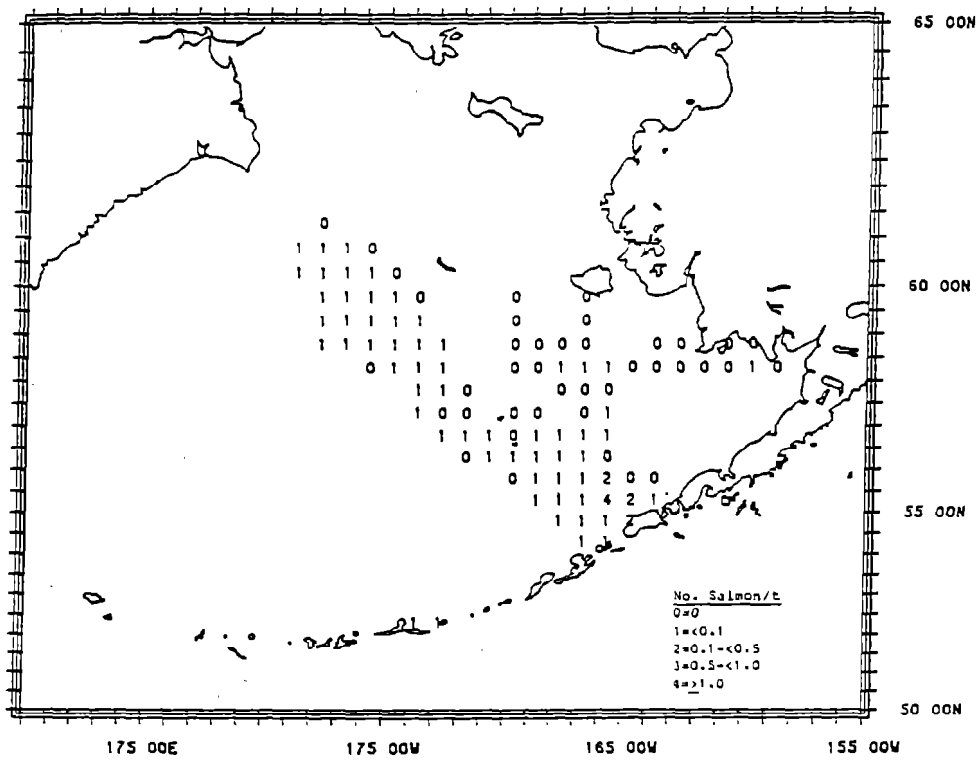


SALMON INCIDENCE 1986 FIRST QUARTER JOINT VENTURE VESSELS

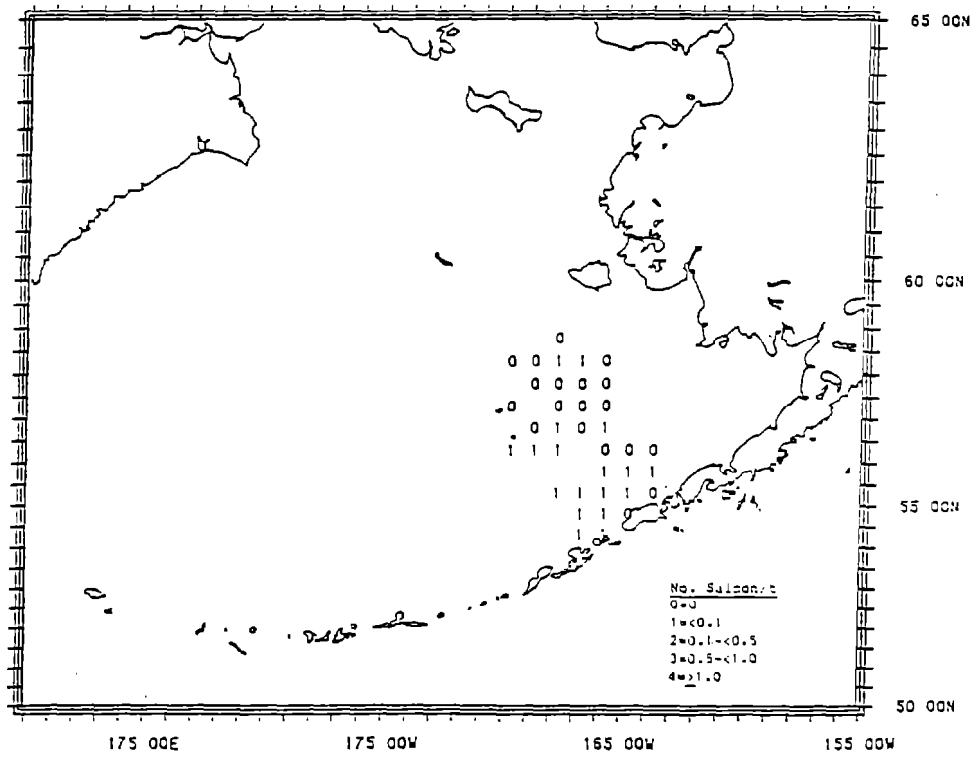


SALMON INCIDENCE 1986 SECOND QUARTER JOINT VENTURE VESSELS

Figure 6.--Average incidence (no./t) of salmon in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1986.

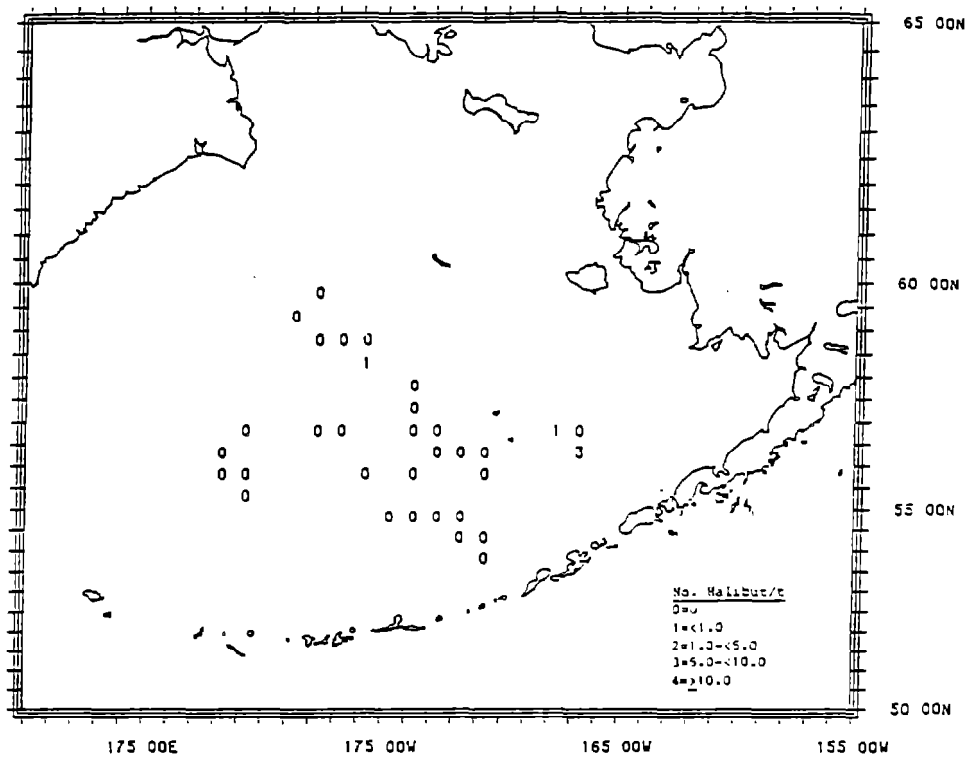


SALMON INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS

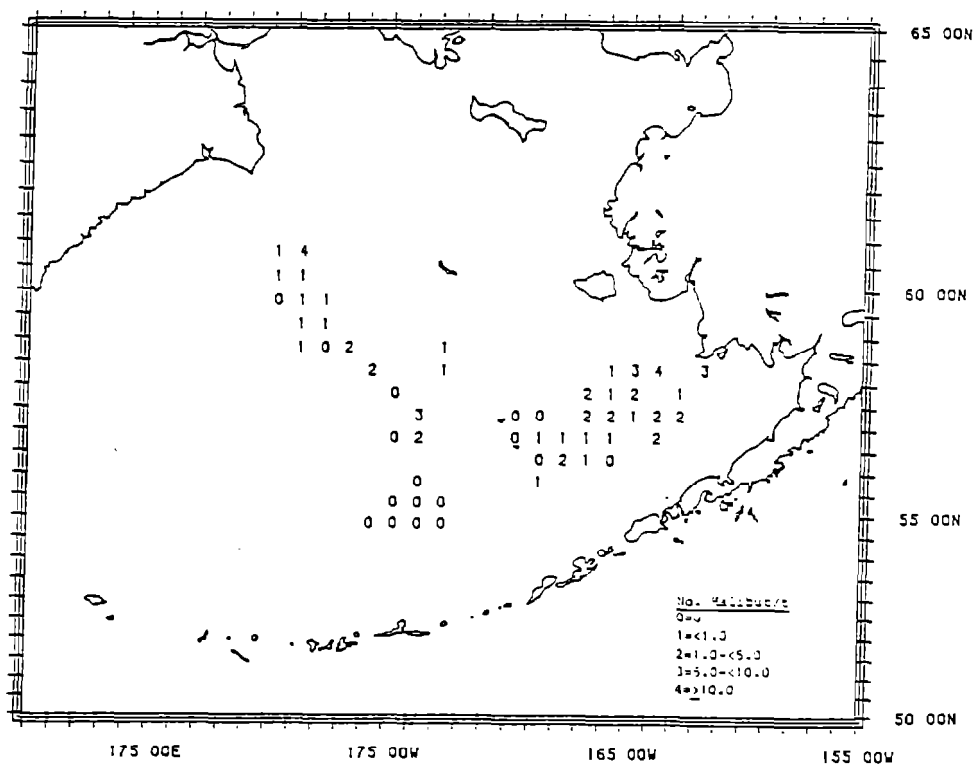


SALMON INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 6. --Continued.

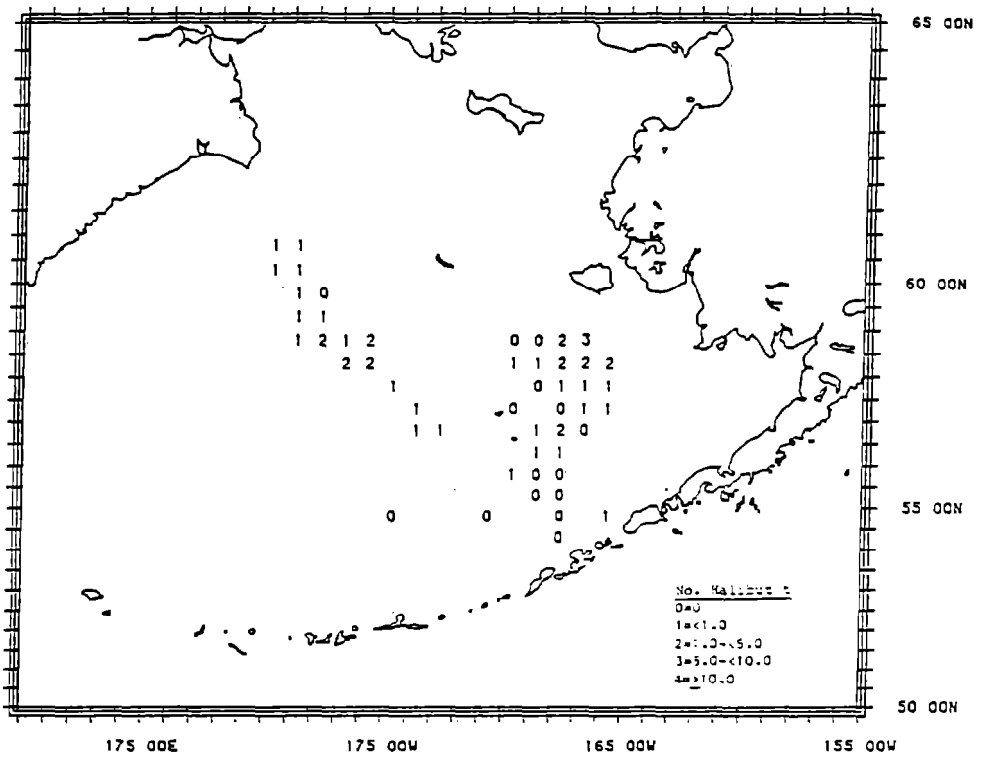


HALIBUT INCIDENCE 1986 FIRST QUARTER SMALL STERN TRAWLERS

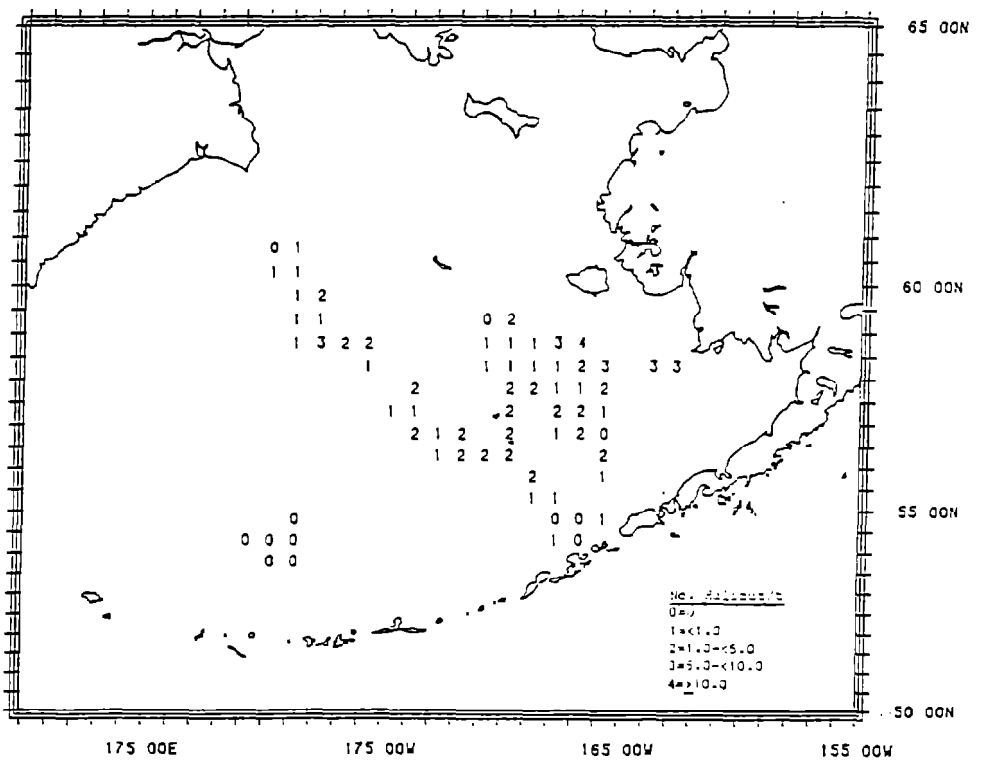


HALIBUT INCIDENCE 1986 SECOND QUARTER SMALL STERN TRAWLERS

Figure 7.--Average incidence (no./t) of Pacific halibut on small stern trawlers (all nations) by quarter and l/2° lat. by 1° long. areas, 1986.

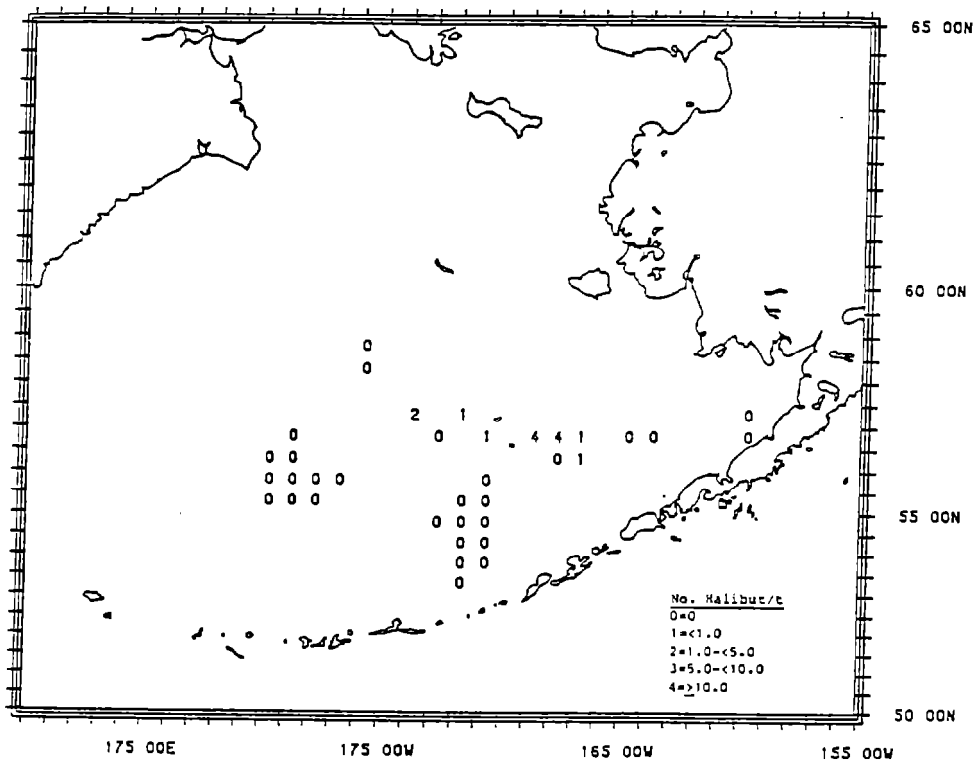


HALIBUT INCIDENCE 1986 THIRD QUARTER SMALL STERN TRAWLERS

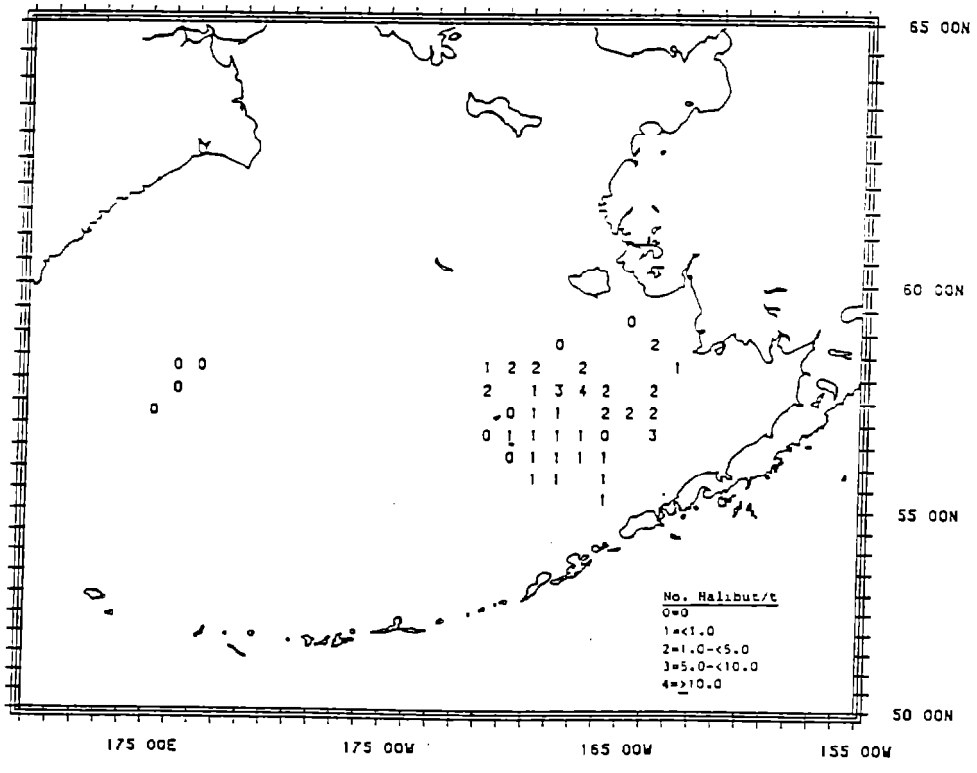


HALIBUT INCIDENCE 1986 FOURTH QUARTER SMALL STERN TRAWLERS

Figure 7. --Continued.

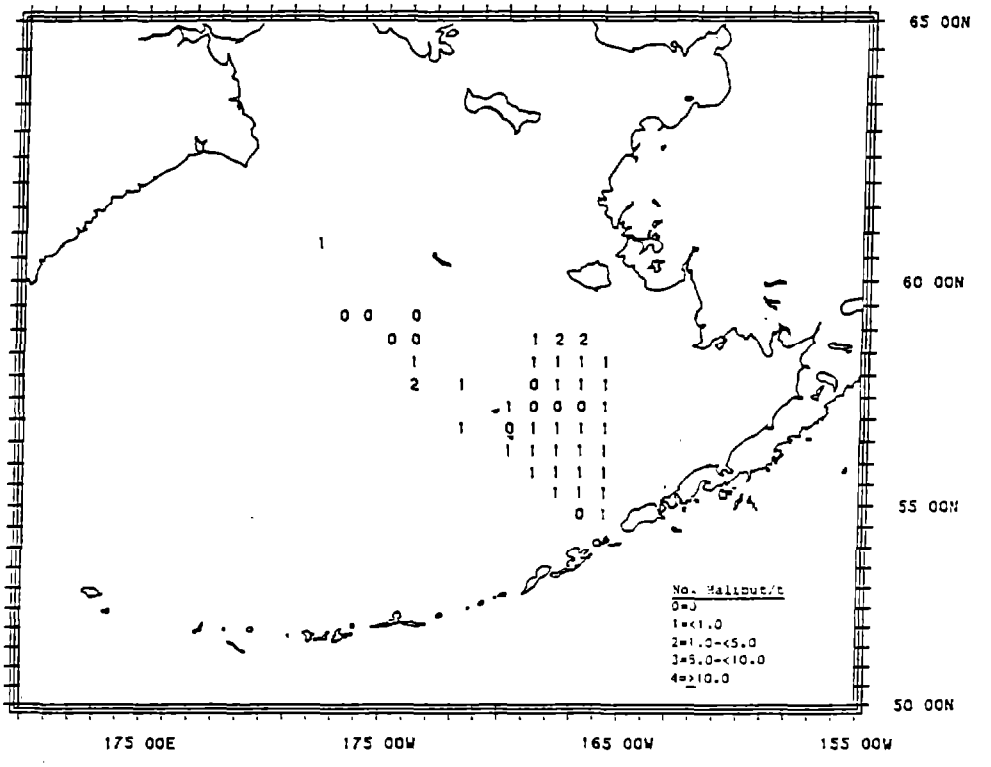


HALIBUT INCIDENCE 1986 FIRST QUARTER LARGE FREEZER TRAWLERS

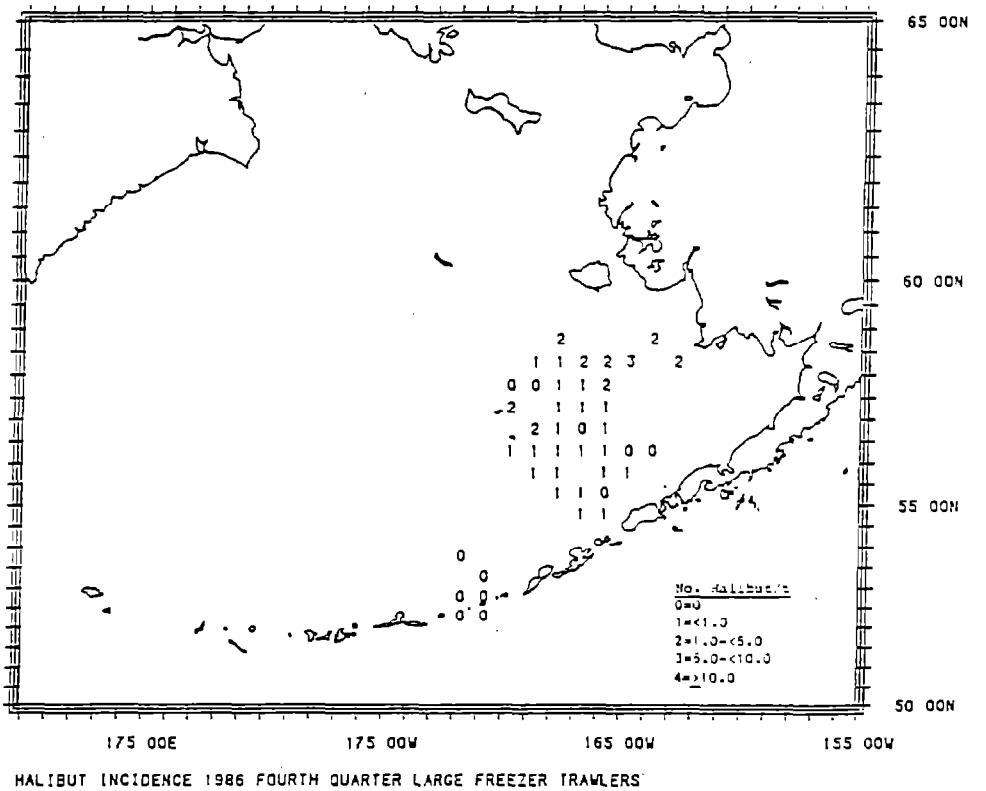


HALIBUT INCIDENCE 1986 SECOND QUARTER LARGE FREEZER TRAWLERS

Figure 8.--Average incidence (no./t) of Pacific halibut on large freezer trawlers (all nations) by quarter and 1/2° lat. by 1° long. areas, 1986.

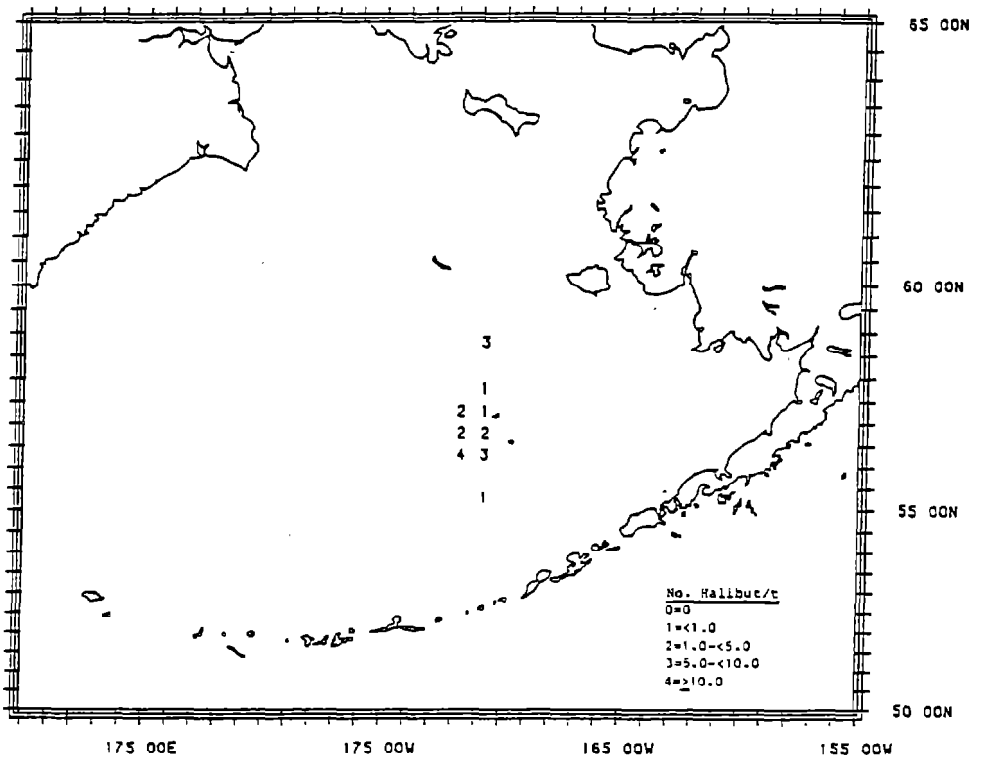


HALIBUT INCIDENCE 1986 THIRD QUARTER LARGE FREEZER TRAWLERS

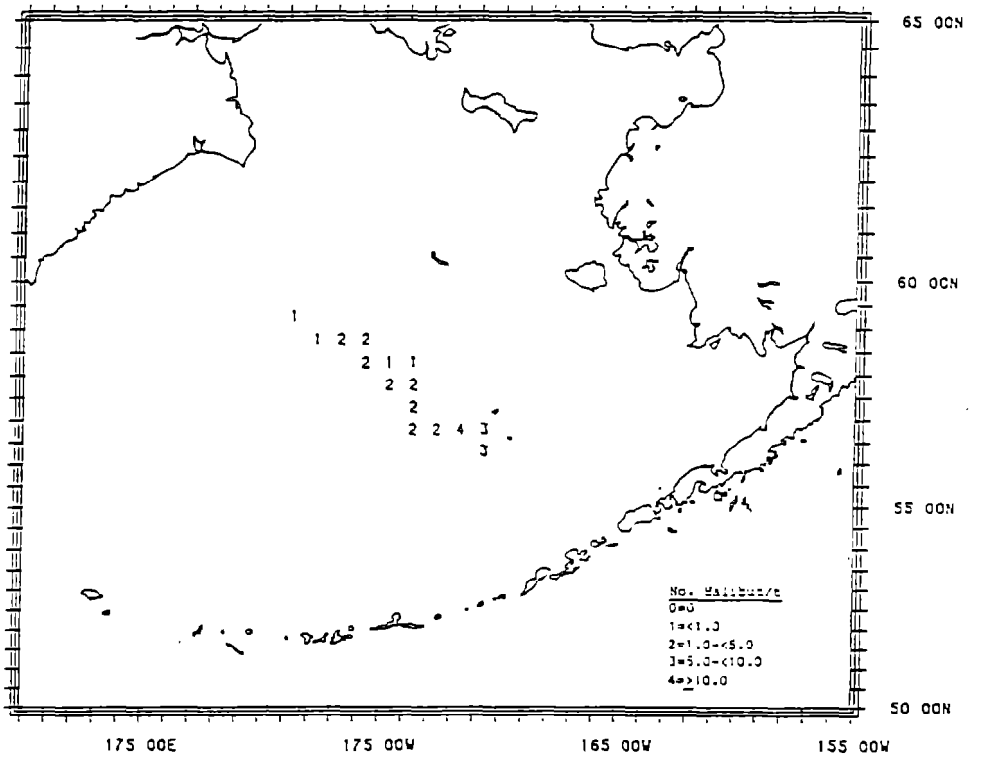


HALIBUT INCIDENCE 1986 FOURTH QUARTER LARGE FREEZER TRAWLERS

Figure 8.--Continued.

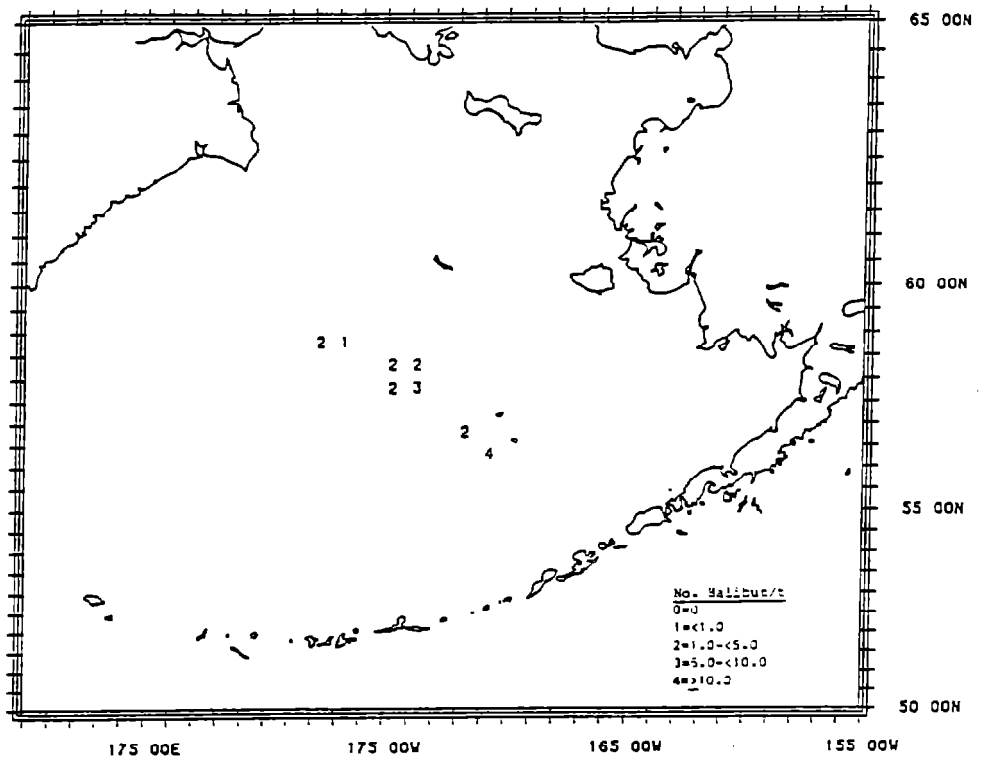


HALIBUT INCIDENCE 1986 FIRST QUARTER LONGLINE VESSELS

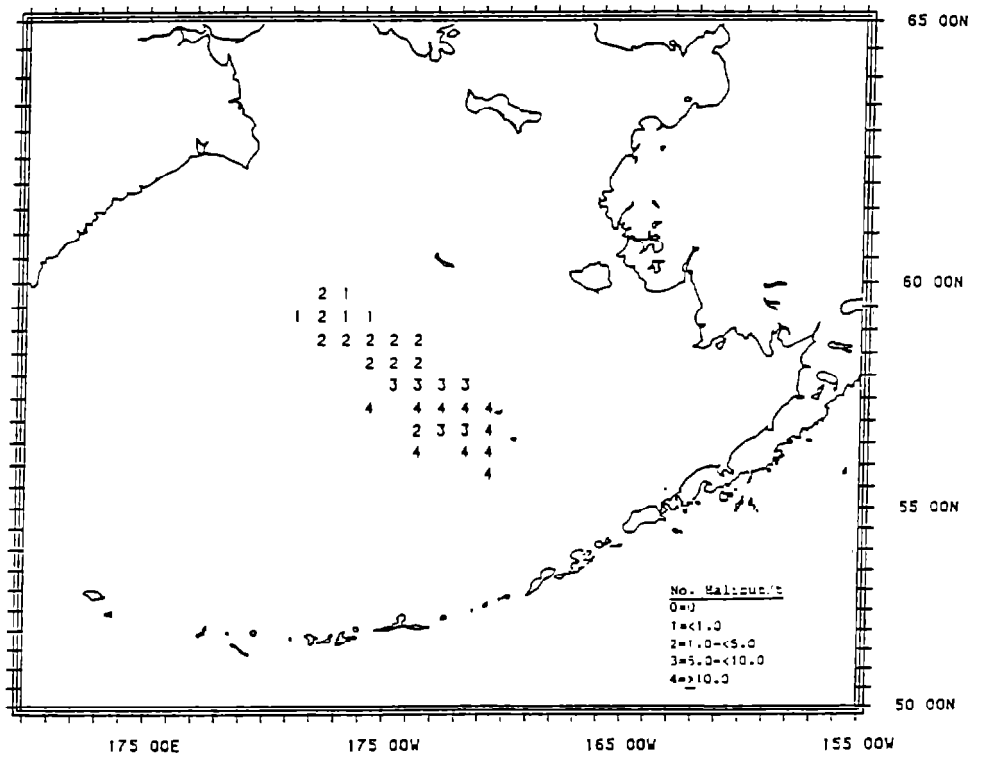


HALIBUT INCIDENCE 1986 SECOND QUARTER LONGLINE VESSELS

Figure 9.--Average incidence (no./t) of Pacific halibut on longline vessels by quarter and l/2° lat. by l° long. areas, 1986.

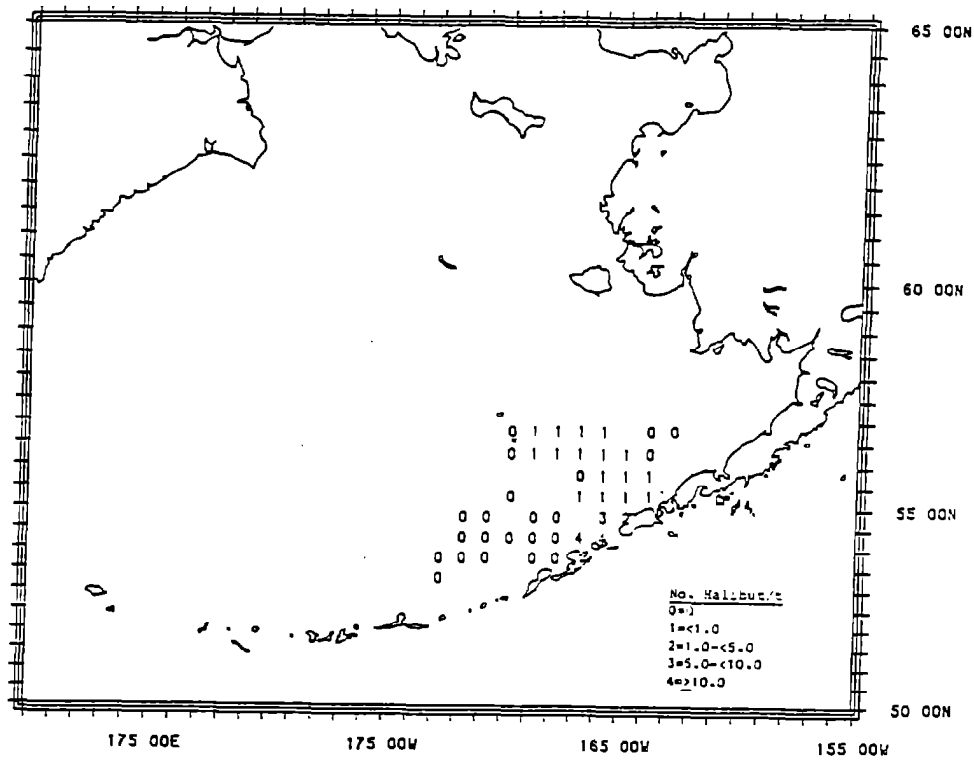


HALIBUT INCIDENCE 1986 THIRD QUARTER LONGLINE VESSELS

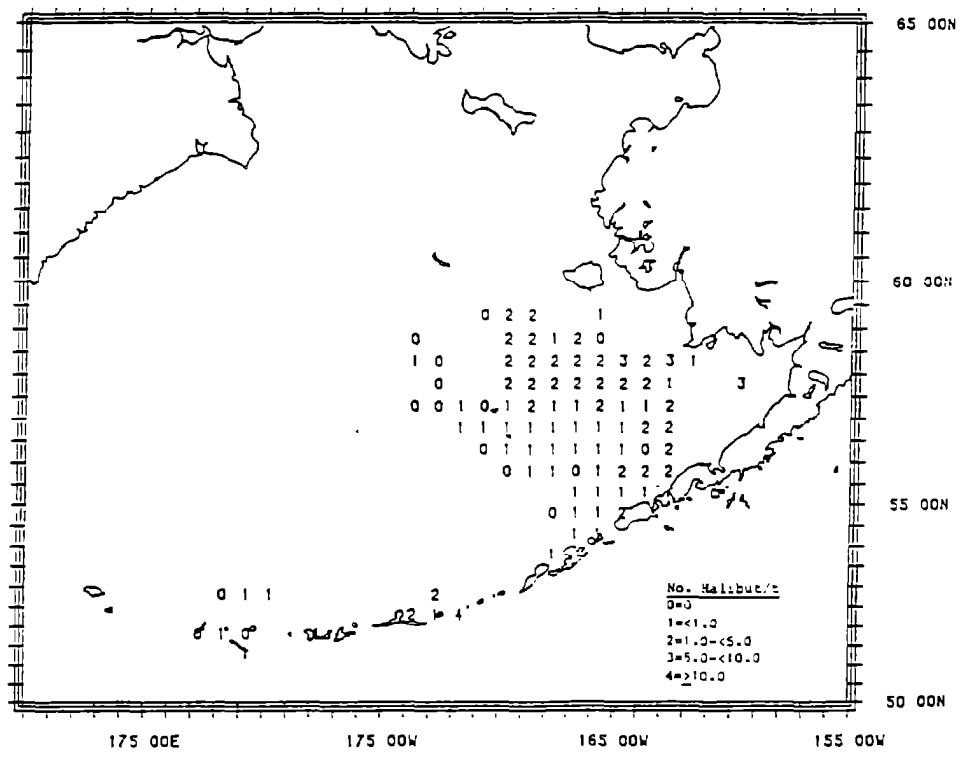


HALIBUT INCIDENCE 1986 FOURTH QUARTER LONGLINE VESSELS

Figure 9. --Continued.

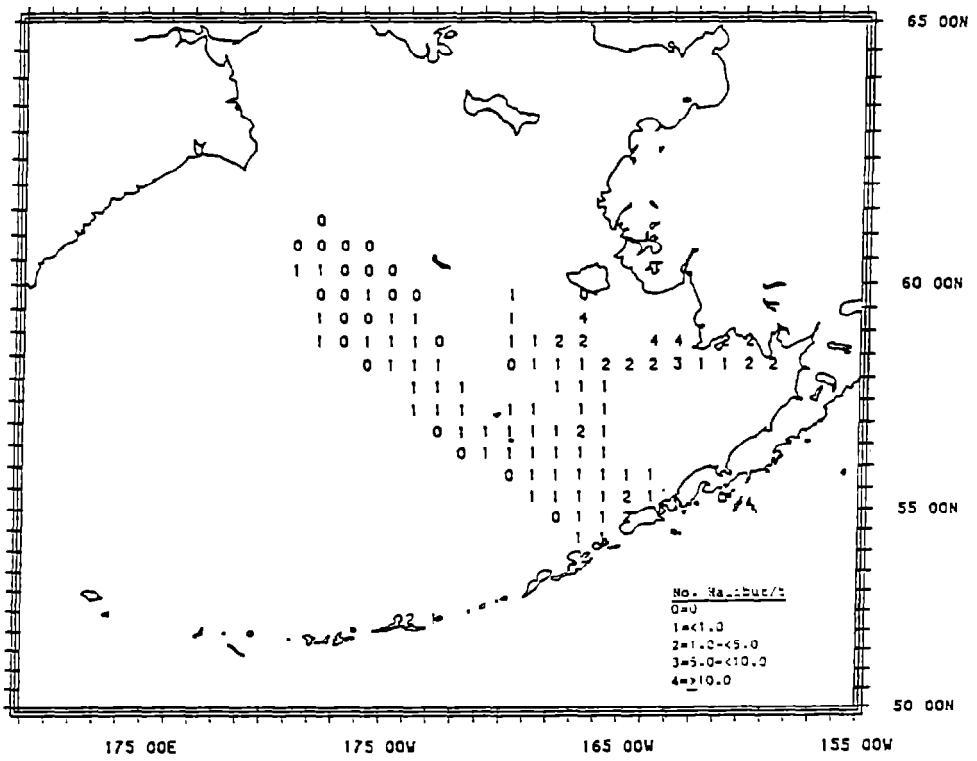


HALIBUT INCIDENCE 1986 FIRST QUARTER JOINT VENTURE VESSELS

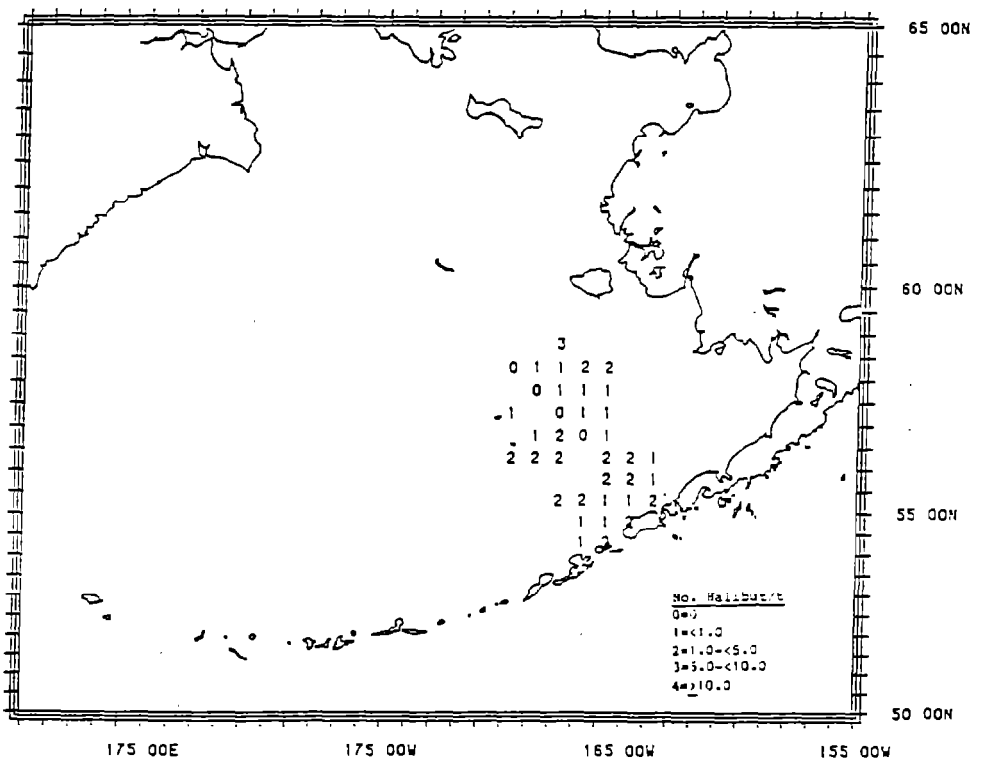


HALIBUT INCIDENCE 1986 SECOND QUARTER JOINT VENTURE VESSELS

Figure 10.--Average incidence (no./t) of Pacific halibut in the joint venture fisheries by quarter and 1/2° lat by 1° long. areas, 1986.

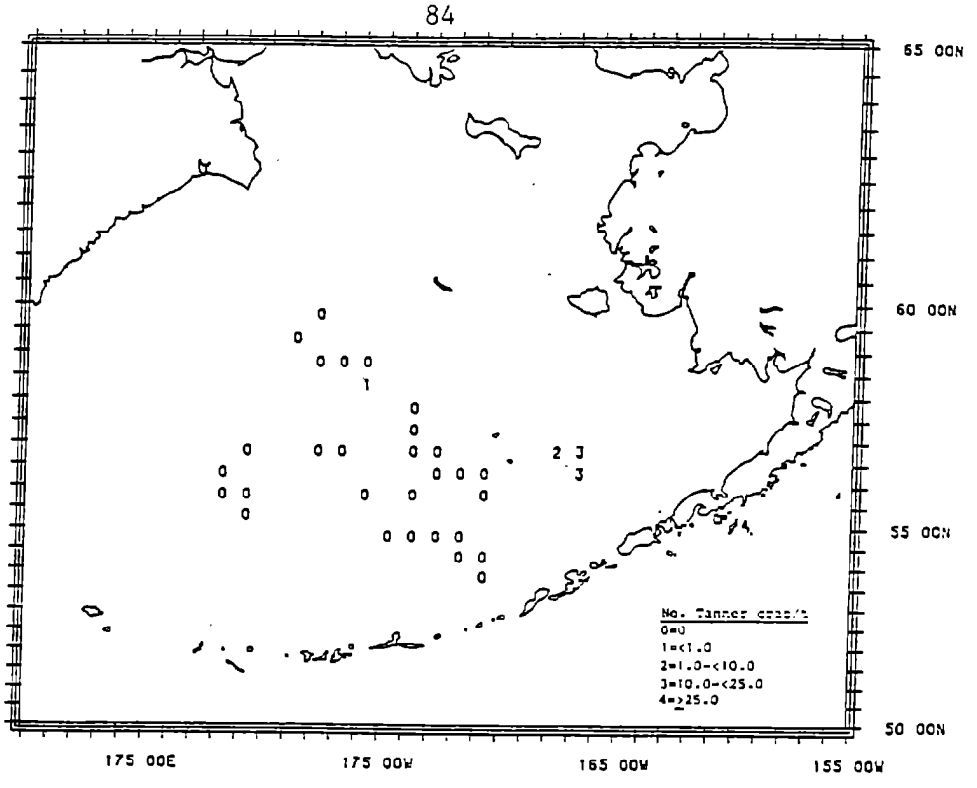


HALIBUT INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS

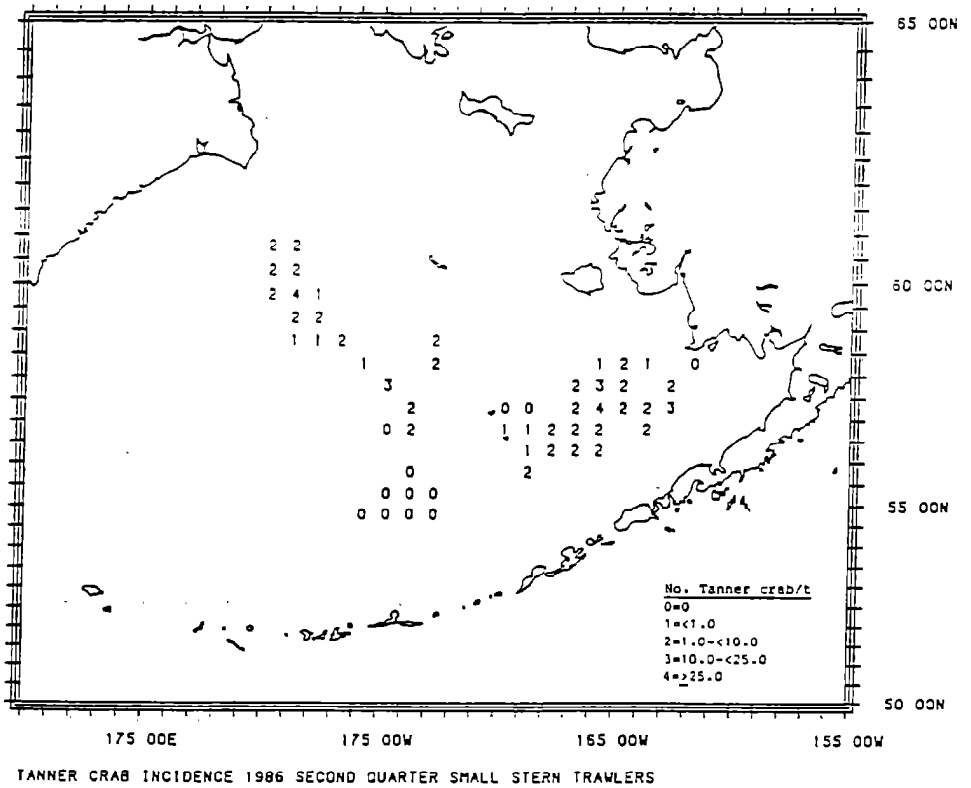


HALIBUT INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 10. --Continued.

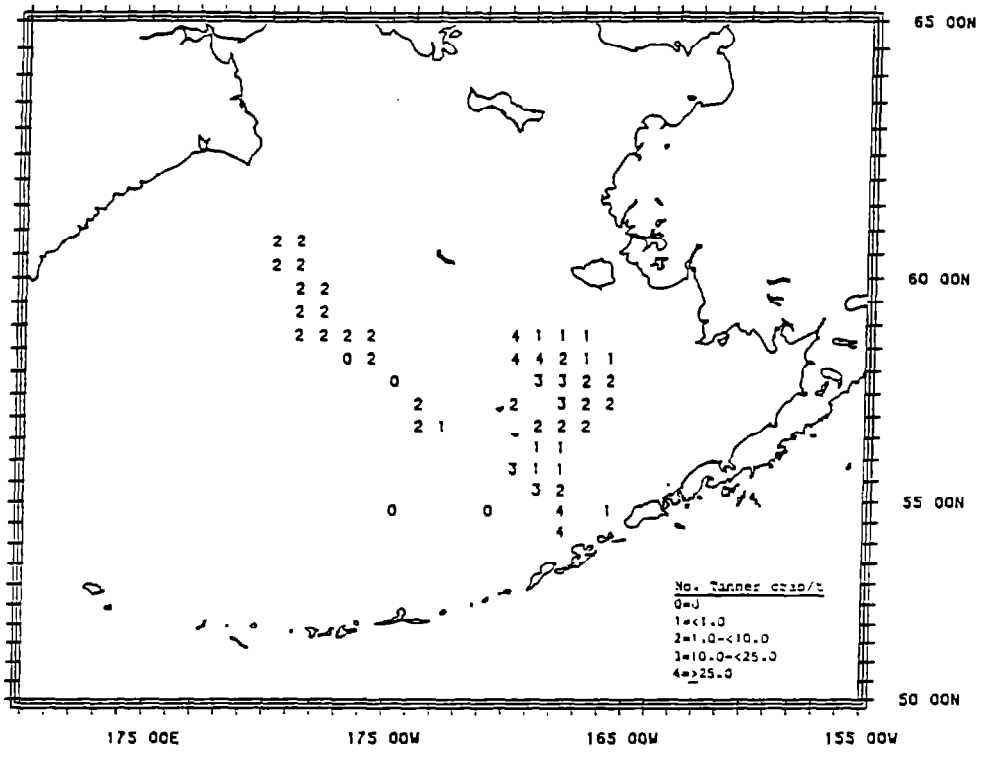


TANNER CRAB INCIDENCE 1986 FIRST QUARTER SMALL STERN TRAWLERS

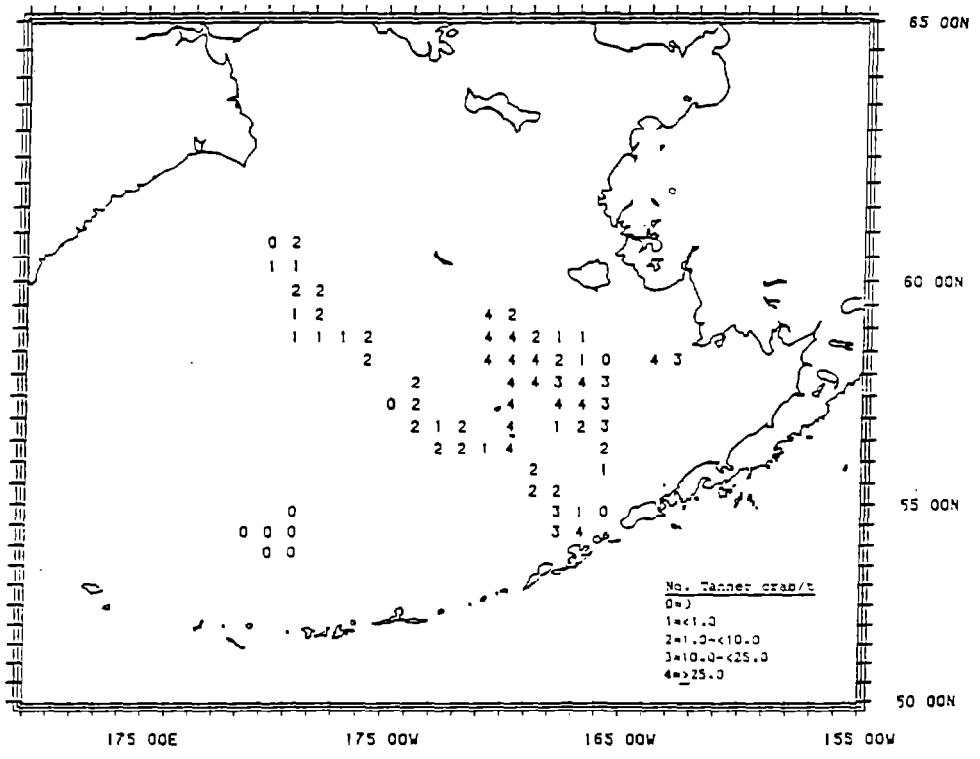


TANNER CRAB INCIDENCE 1986 SECOND QUARTER SMALL STERN TRAWLERS

Figure 11 .--Average incidence (no./t) of Tanner crab on small stern trawlers (all nations) by quarter and 1,/2° lat. by 1° long. areas, 1986.

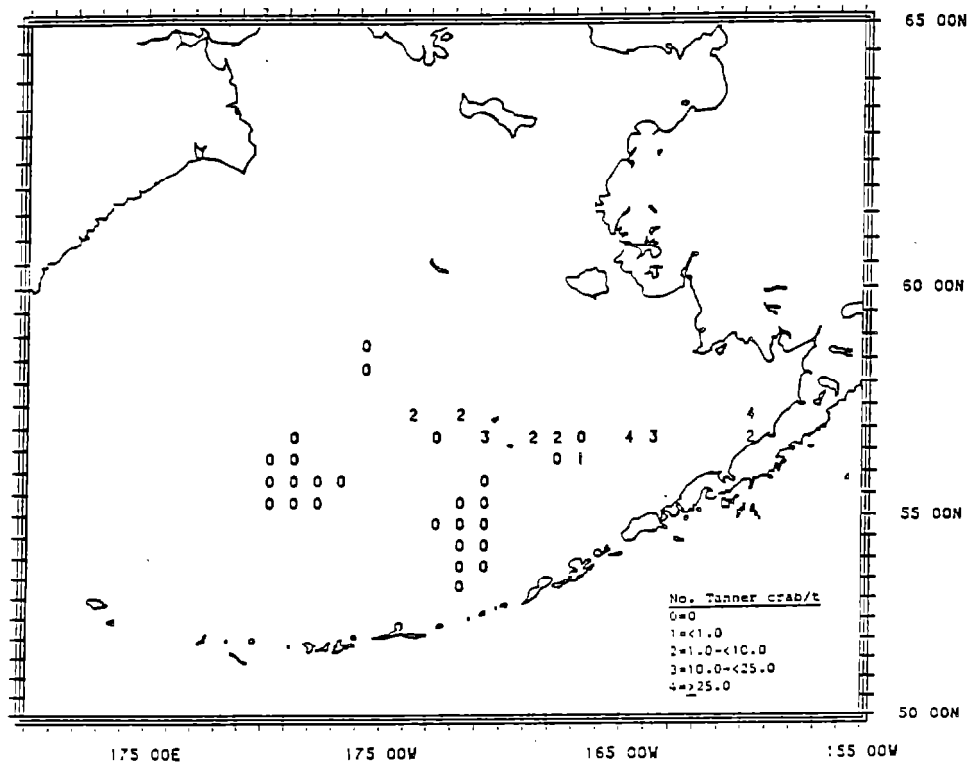


TANNER CRAB INCIDENCE 1986 THIRD QUARTER SMALL STERN TRAWLERS

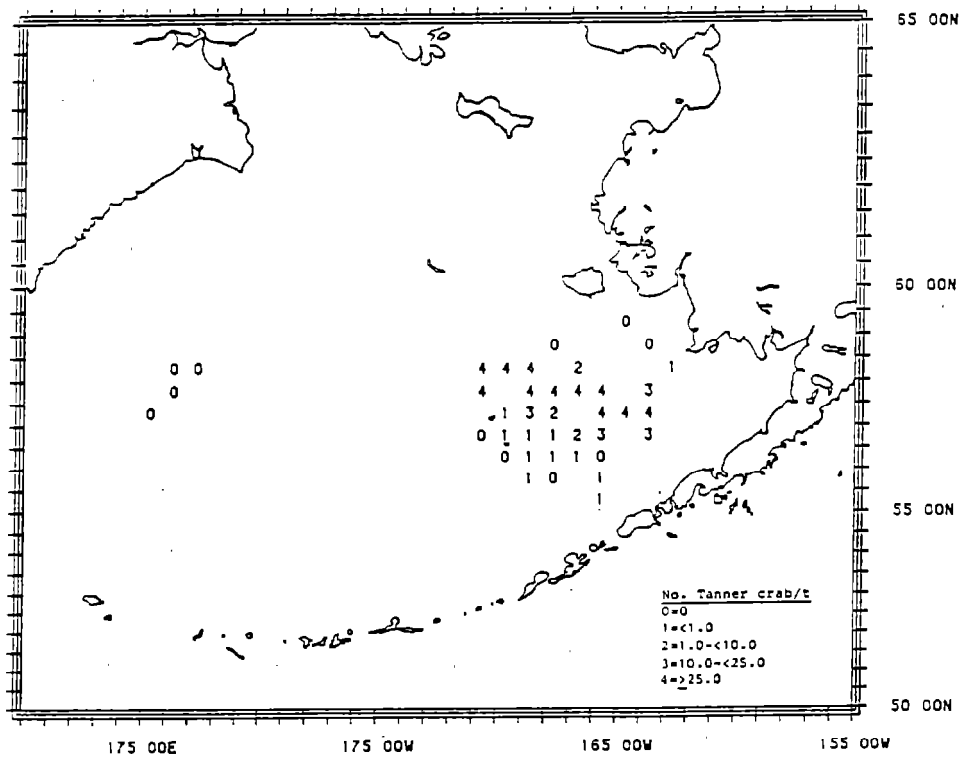


TANNER CRAB INCIDENCE 1986 FOURTH QUARTER SMALL STERN TRAWLERS

Figure 11 .--Continued.

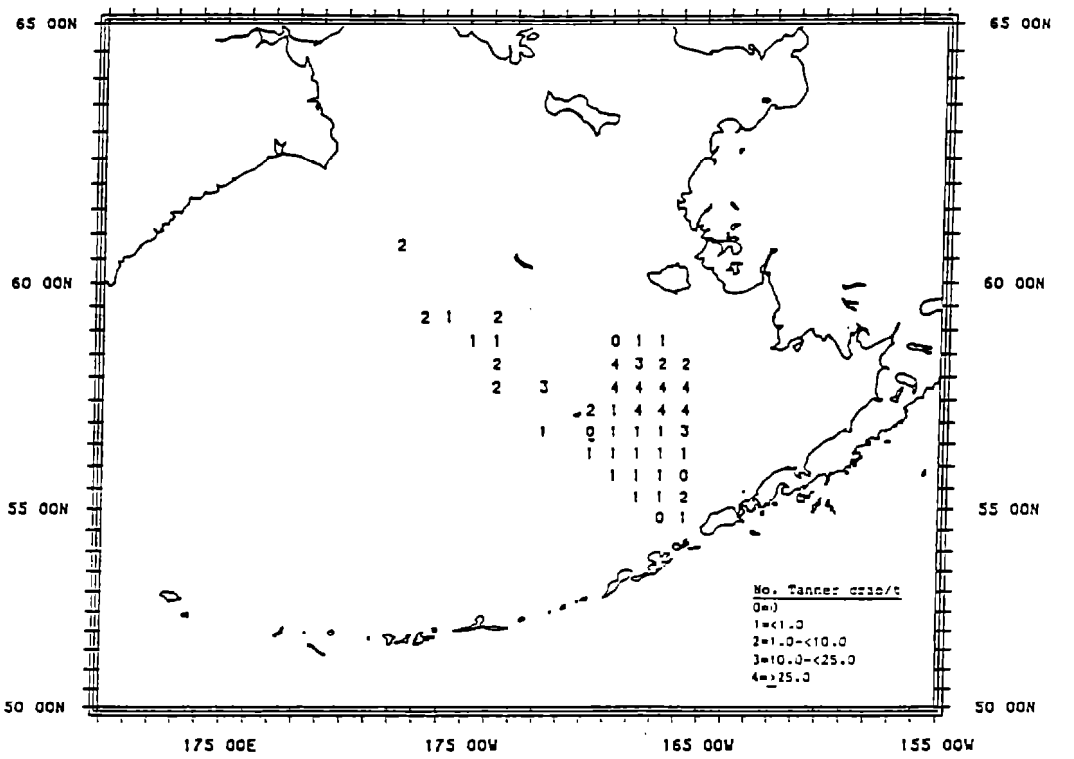


TANNER CRAB INCIDENCE 1986 FIRST QUARTER LARGE FREEZER TRAWLERS

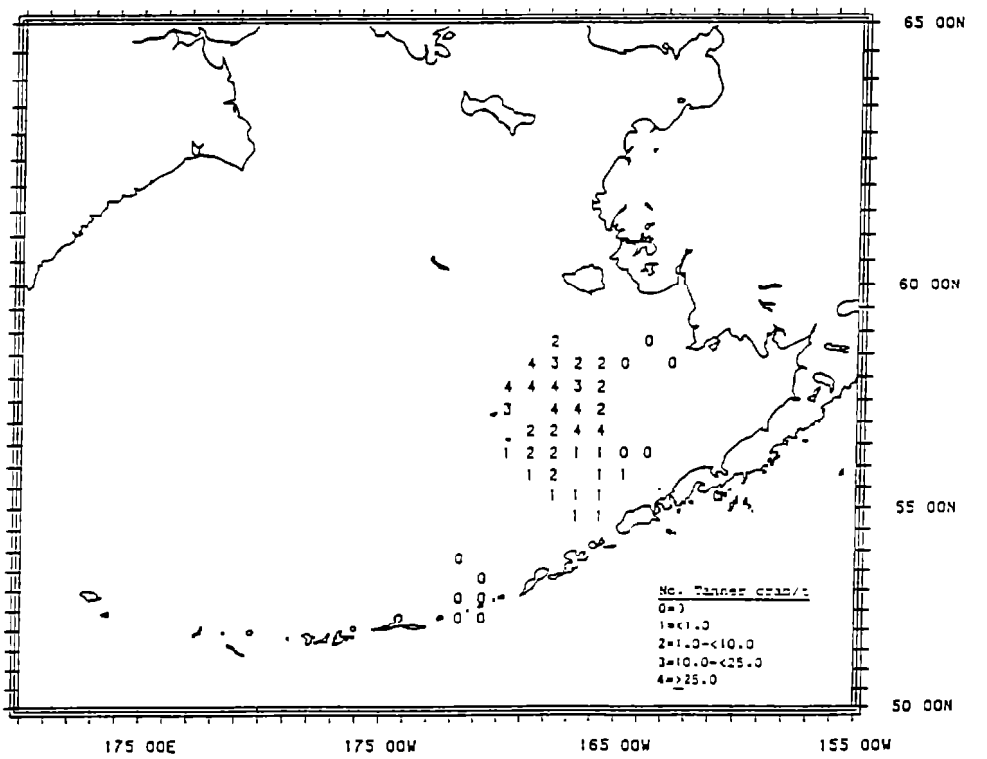


TANNER CRAB INCIDENCE 1986 SECOND QUARTER LARGE FREEZER TRAWLERS

Figure 12.--Average incidence (no./t) of Tanner crab on large freezer trawlers (all nations) by quarter and l/2° lat. by l° long. areas, 1986.

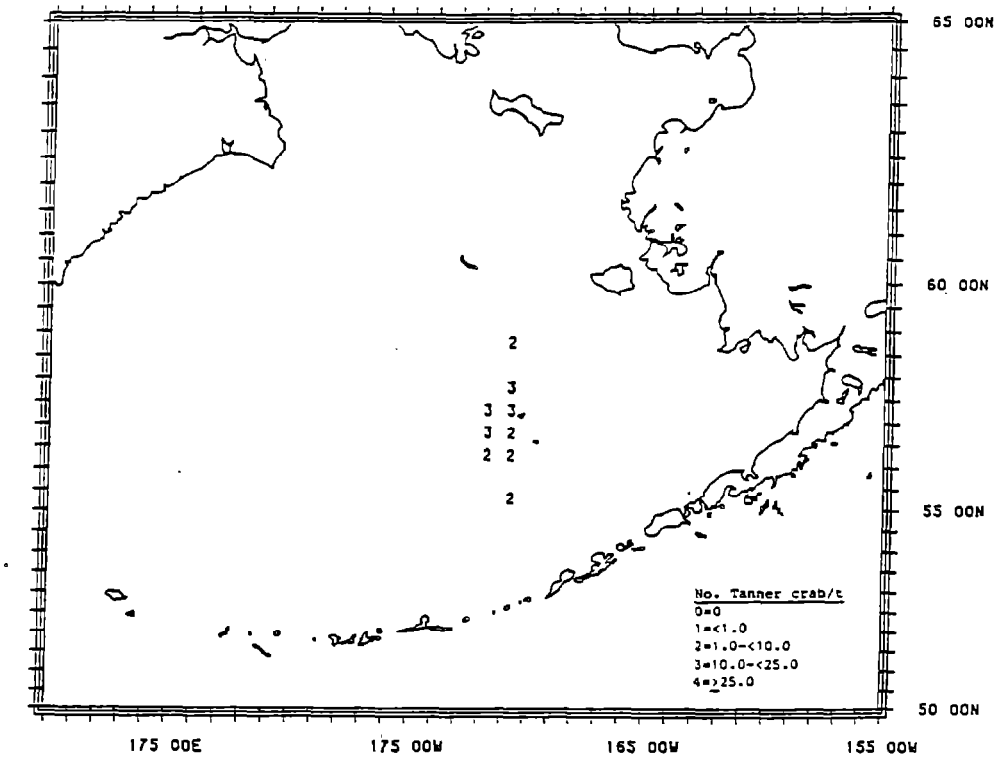


TANNER CRAB INCIDENCE 1986 THIRD QUARTER LARGE FREEZER TRAWLERS

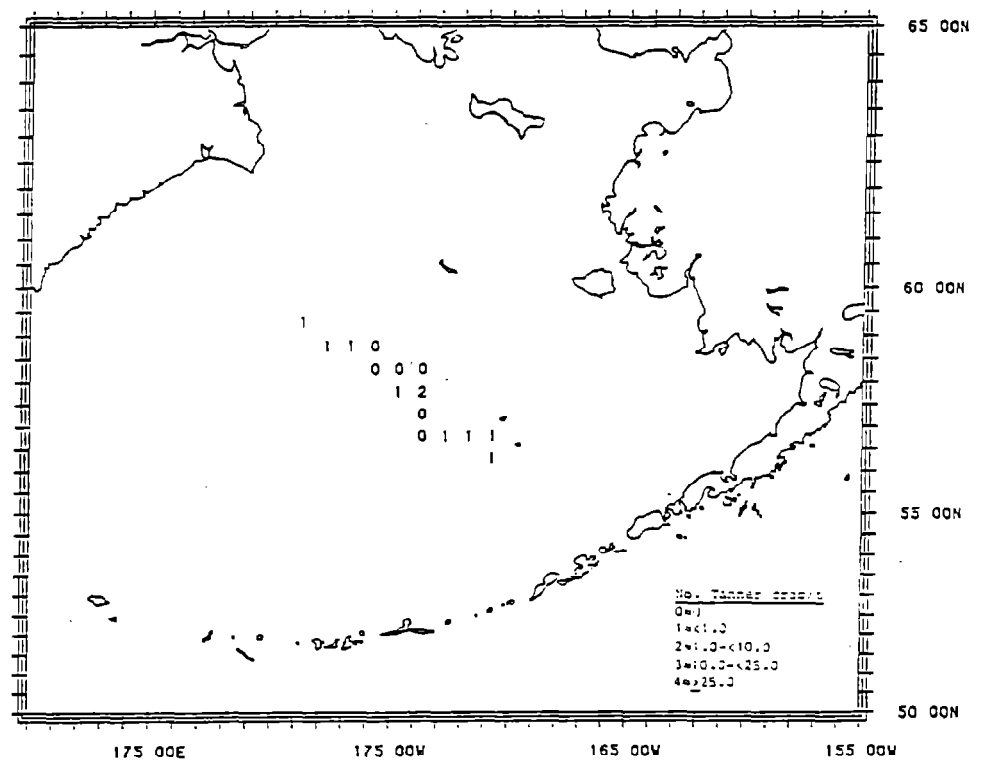


TANNER CRAB INCIDENCE 1986 FOURTH QUARTER LARGE FREEZER TRAWLERS

Figure 12.--Continued.

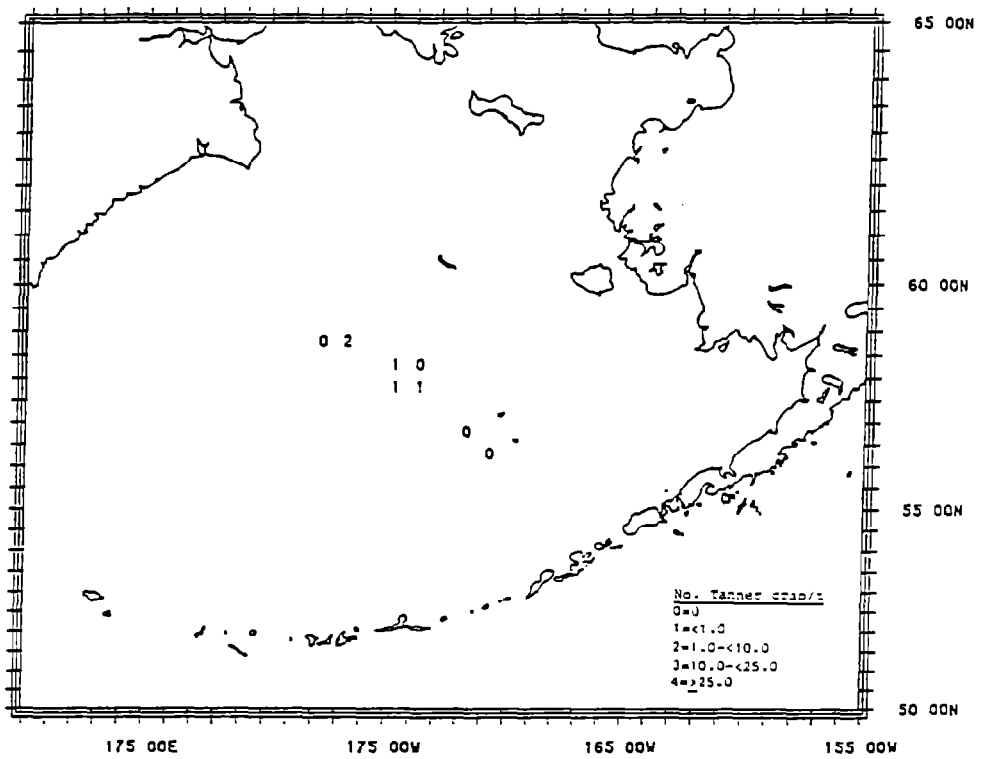


TANNER CRAB INCIDENCE 1986 FIRST QUARTER LONGLINE VESSELS

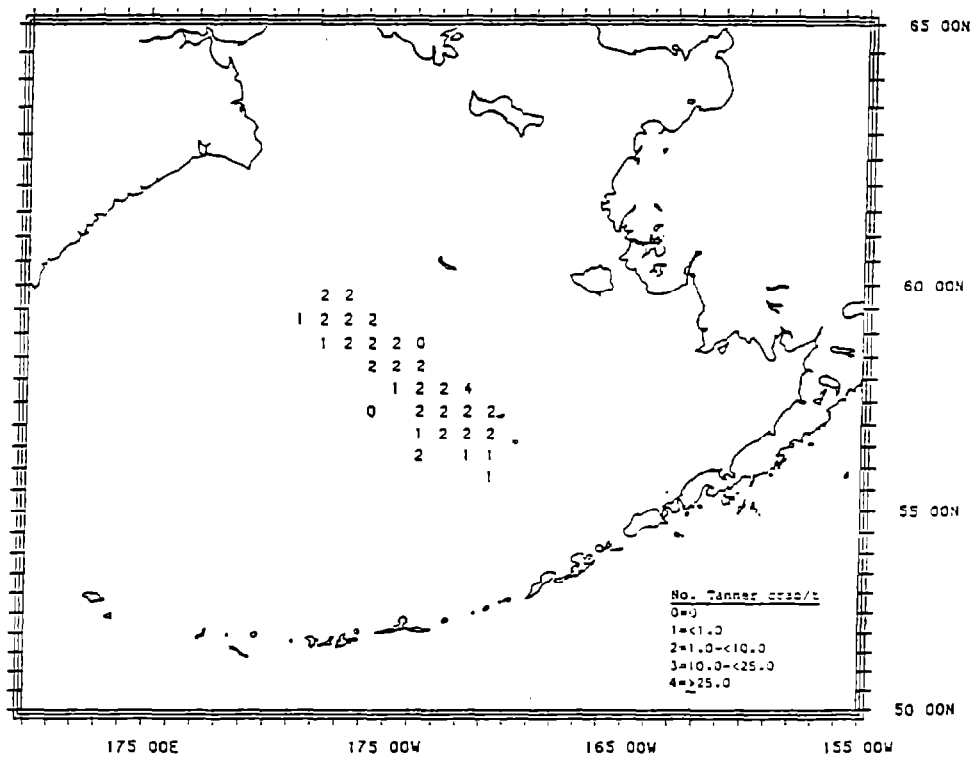


TANNER CRAB INCIDENCE 1986 SECOND QUARTER LONGLINE VESSELS

Figure 13.--Average incidence (no./t) of Tanner crab on longline vessels by quarter and l/2° lat. by l° long. areas, 1986.

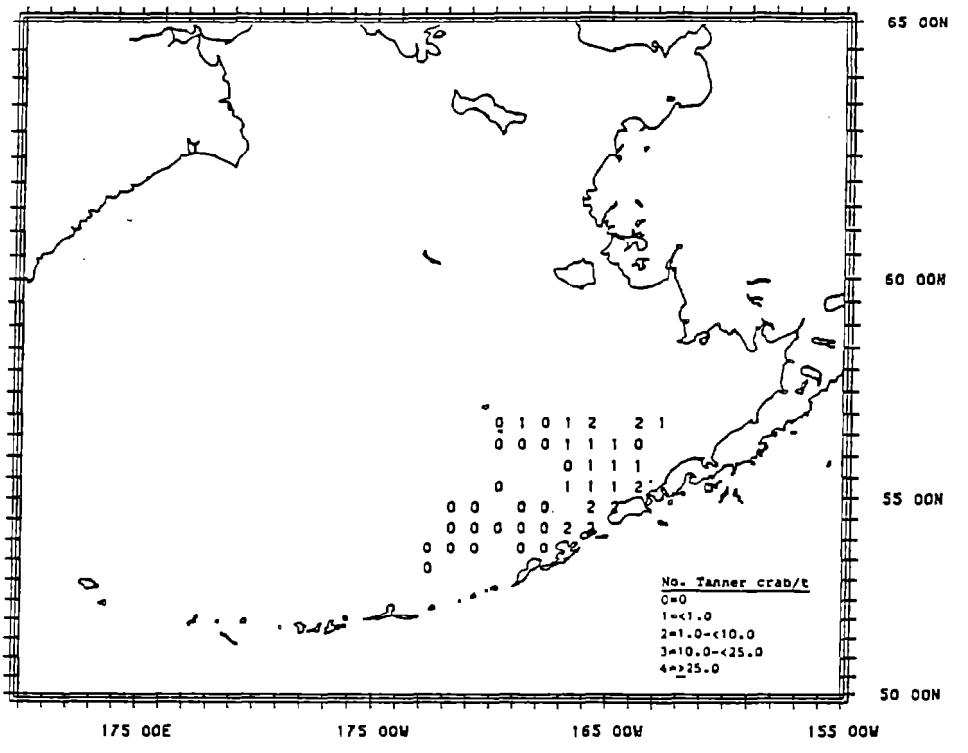


TANNER CRAB INCIDENCE 1986 THIRD QUARTER LONGLINE VESSELS

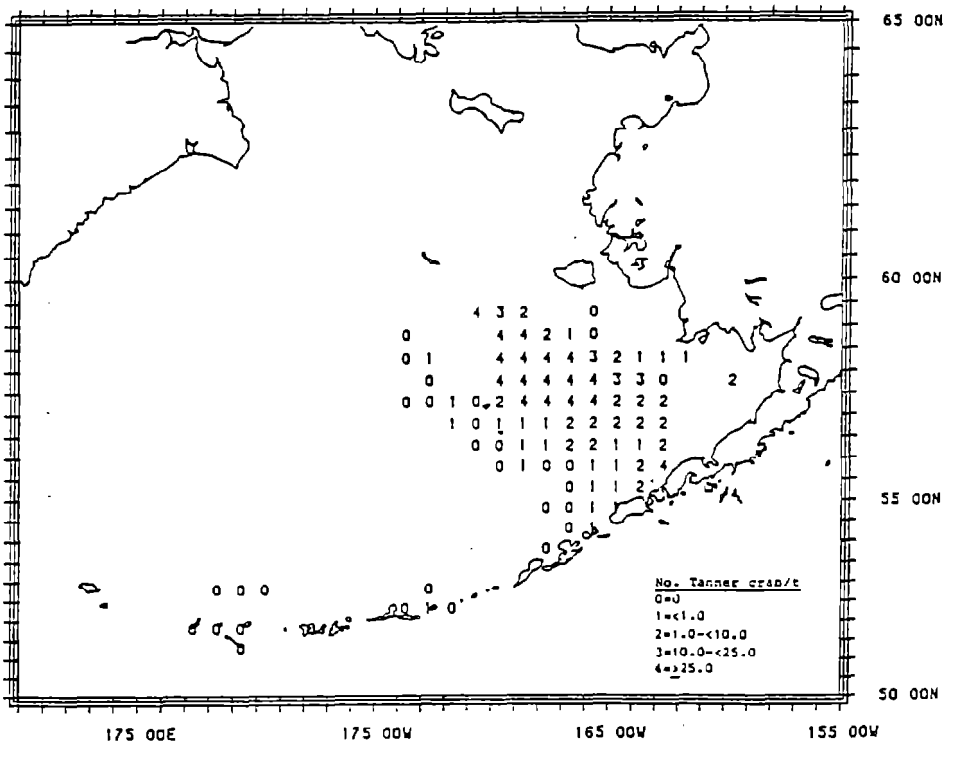


TANNER CRAB INCIDENCE 1986 FOURTH QUARTER LONGLINE VESSELS

Figure 13. --Continued .

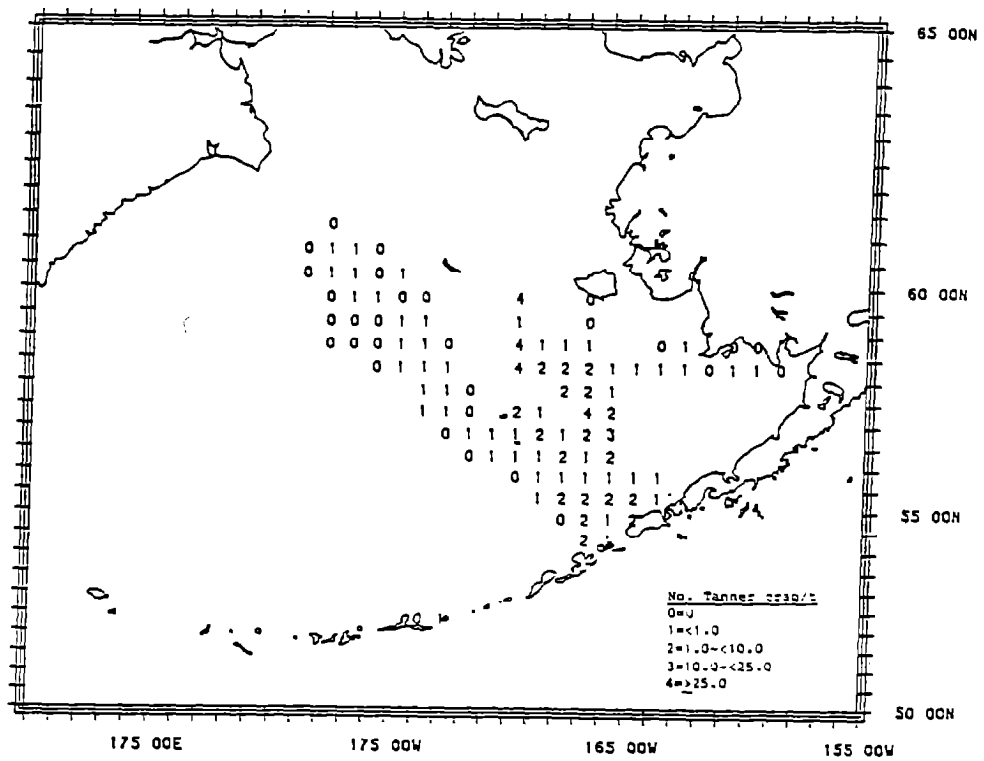


TANNER CRAB INCIDENCE 1986 FIRST QUARTER JOINT VENTURE VESSELS

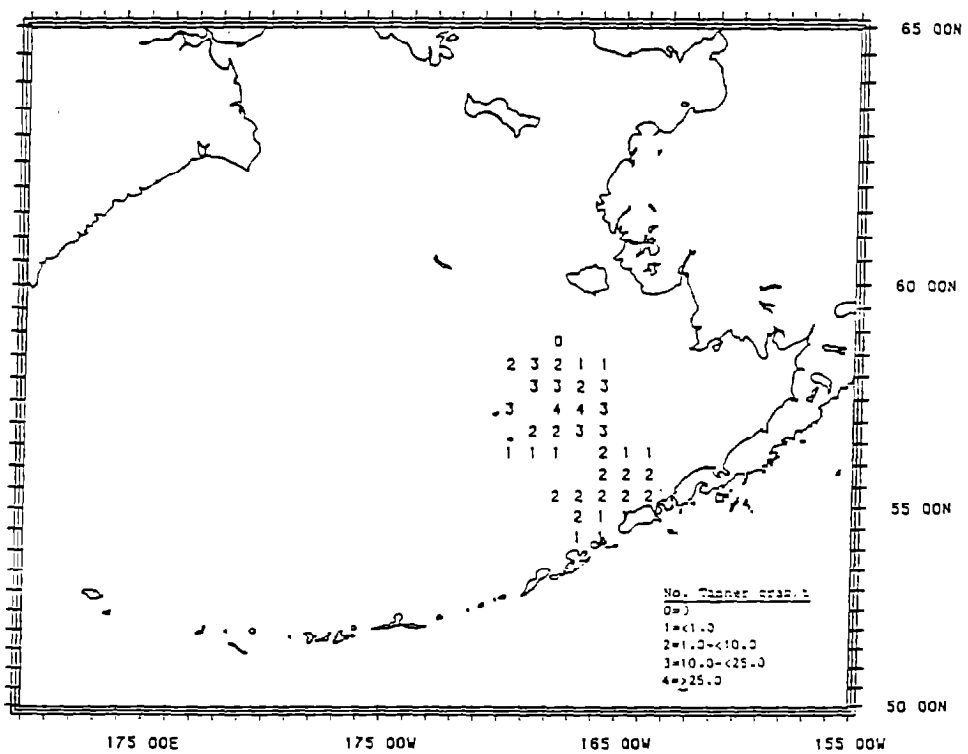


TANNER CRAB INCIDENCE 1986 SECOND QUARTER JOINT VENTURE VESSELS

Figure 14.--Average incidence (no./t) of Tanner crab in the joint venture fisheries by quarter and l/2° lat. by l° long. areas, 1986.

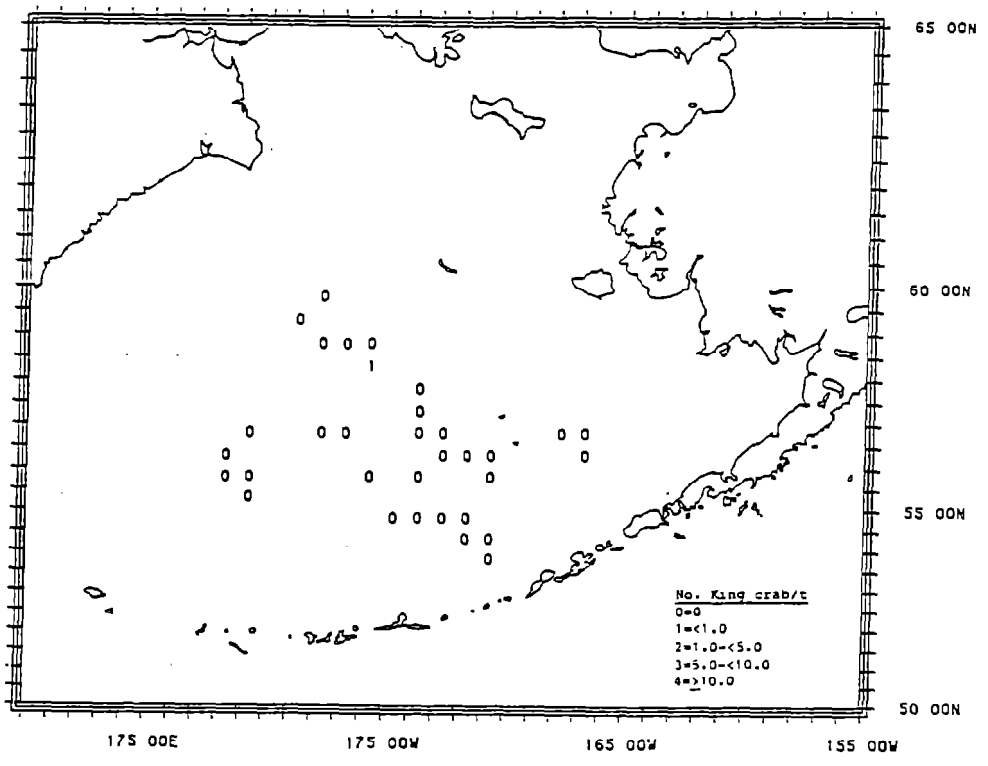


TANNER CRAB INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS

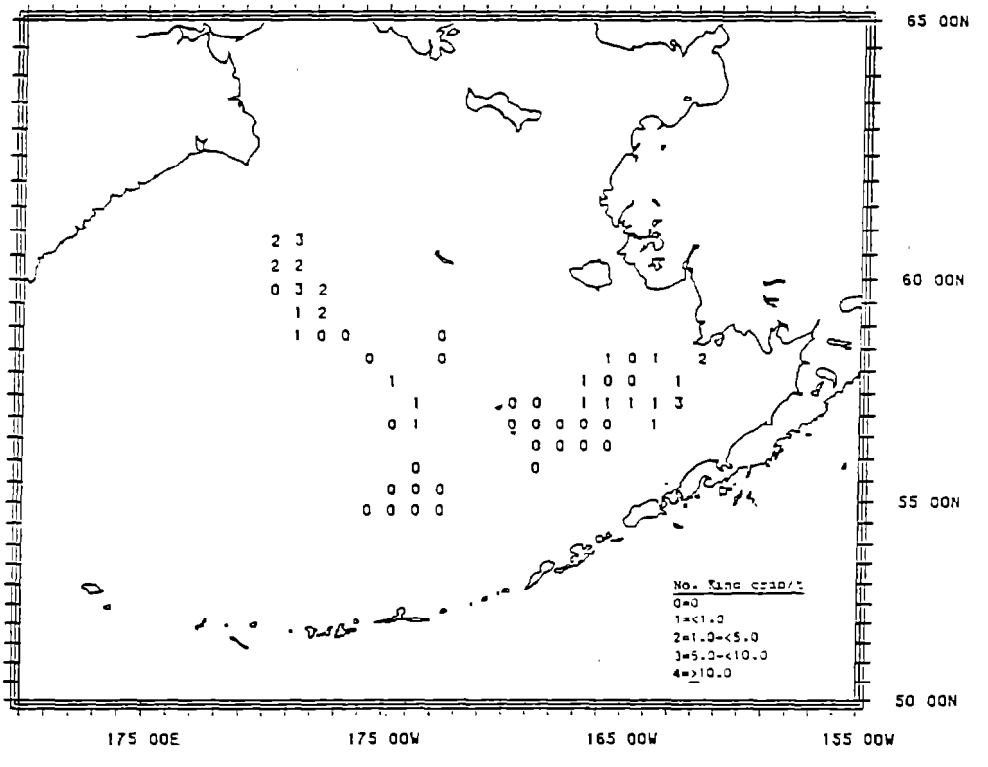


TANNER CRAB INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 14.--Continued.

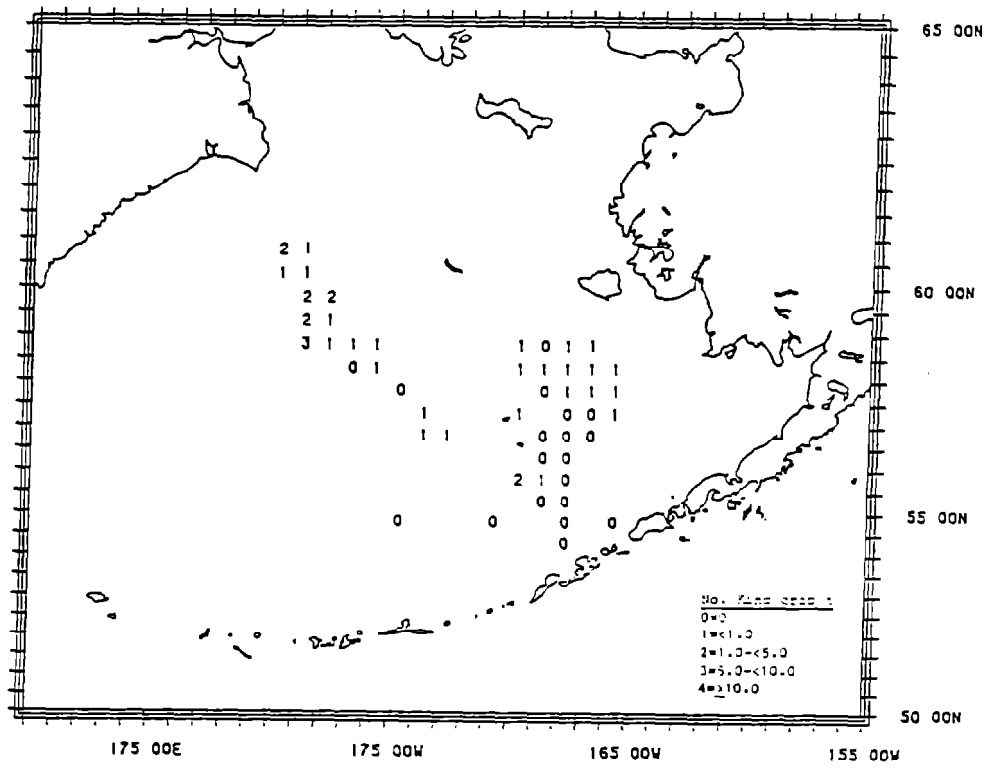


KING CRAB INCIDENCE 1986 FIRST QUARTER SMALL STERN TRAWLERS

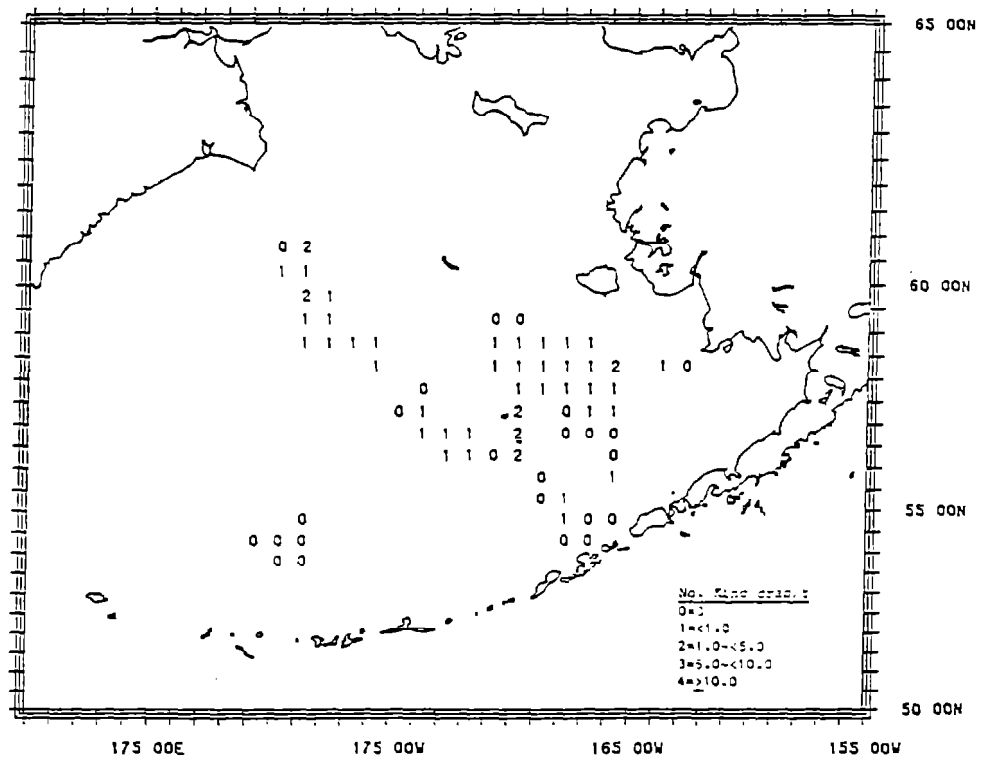


KING CRAB INCIDENCE 1986 SECOND QUARTER SMALL STERN TRAWLERS

Figure 15.--Average incidence (no./t) of king crab on small stern trawlers (all nations) by quarter and l/2° lat. by l° long. areas, 1986.

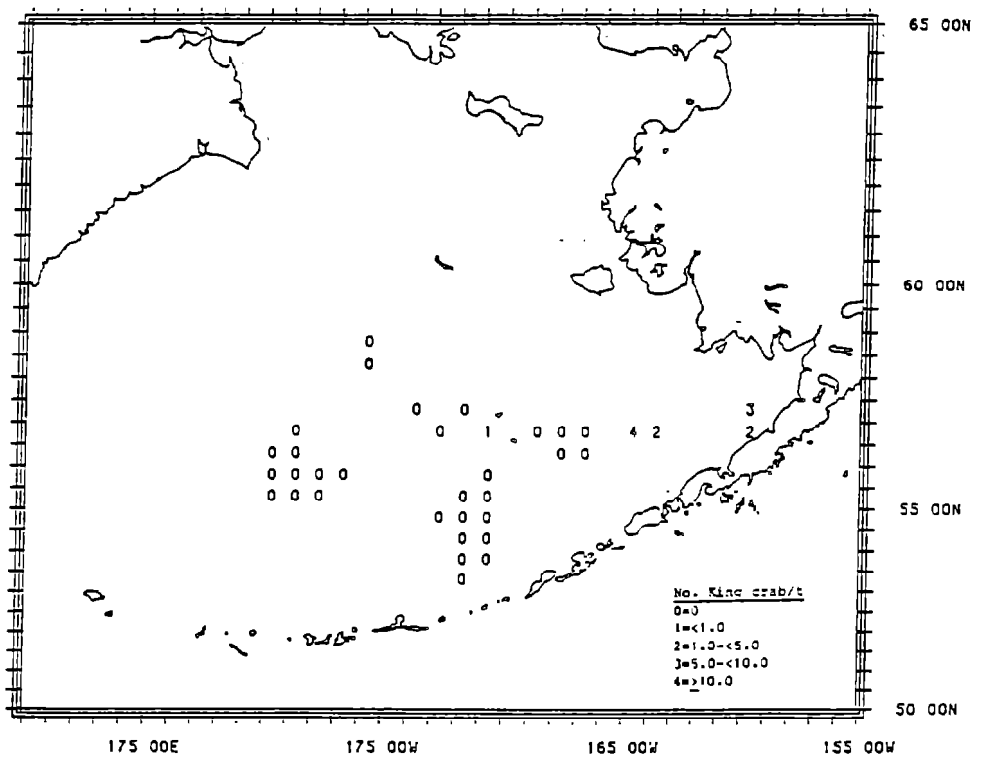


KING CRAB INCIDENCE 1986 THIRD QUARTER SMALL STERN TRAWLERS

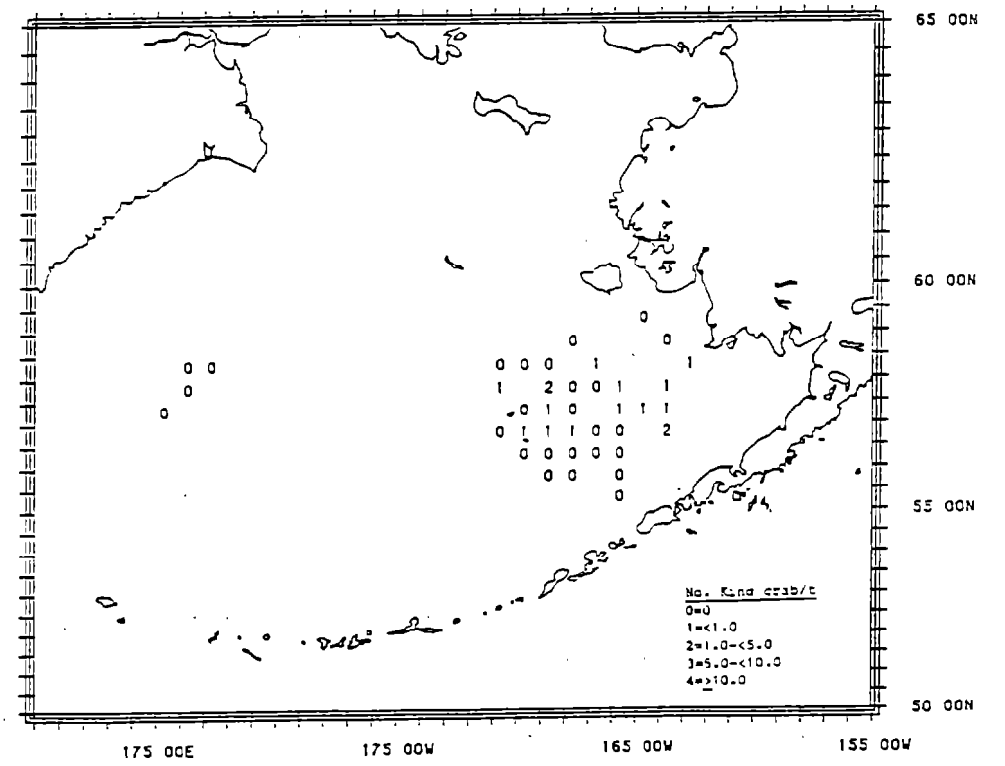


KING CRAB INCIDENCE 1986 FOURTH QUARTER SMALL STERN TRAWLERS

Figure 15.--Continued.

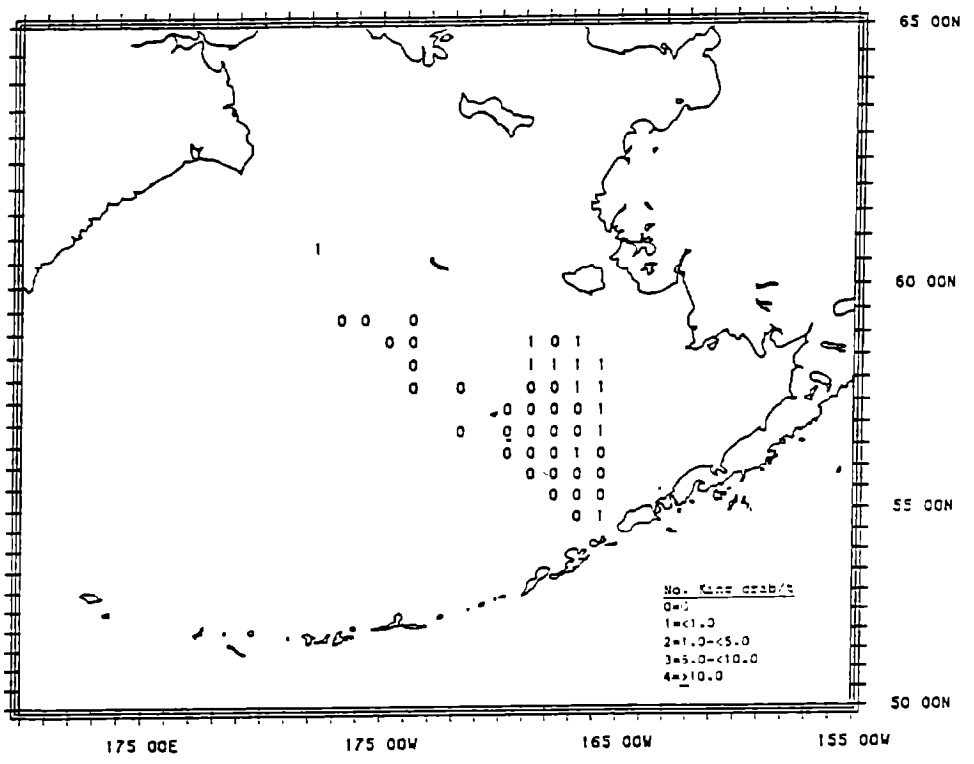


KING CRAB INCIDENCE 1986 FIRST QUARTER LARGE FREEZER TRAWLERS

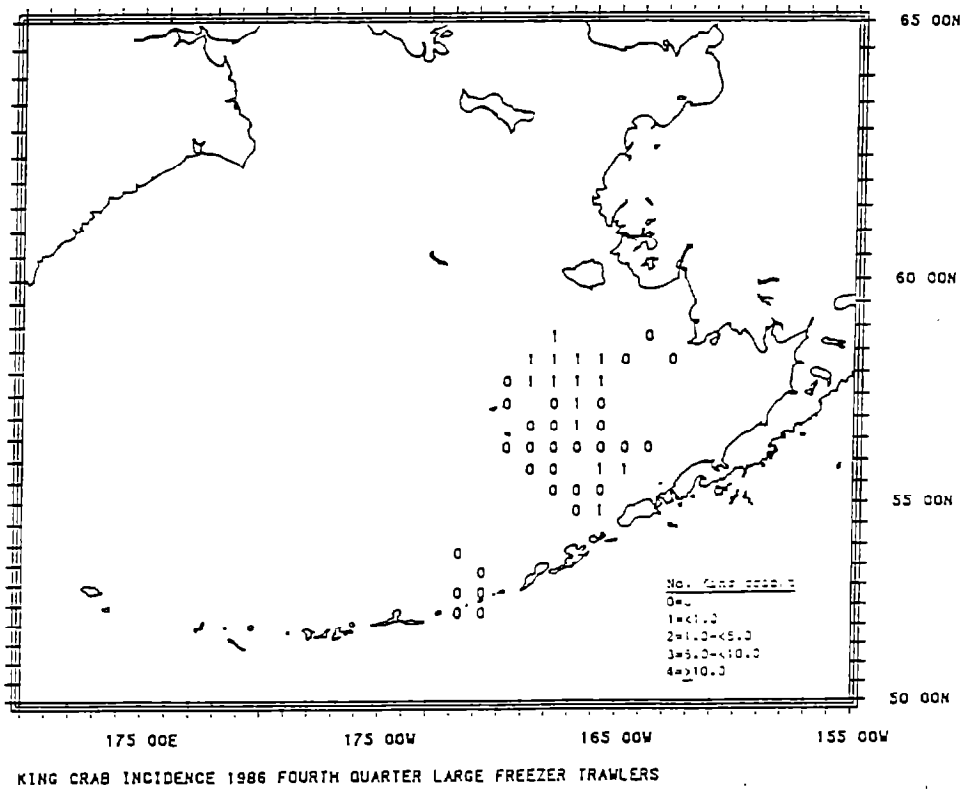


KING CRAB INCIDENCE 1986 SECOND QUARTER LARGE FREEZER TRAWLERS

Figure 16.--Average incidence (no./t) of king crab on large freezer trawlers (all nations) by quarter and l/2° lat. by 1° long. areas, 1986.

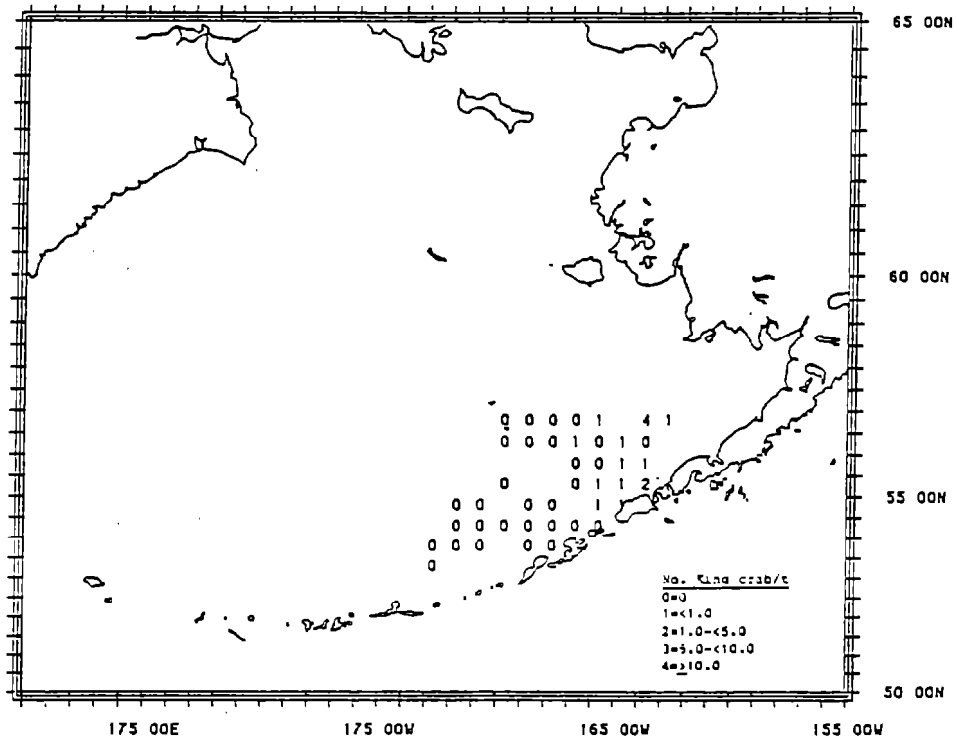


KING CRAB INCIDENCE 1986 THIRD QUARTER LARGE FREEZER TRAWLERS

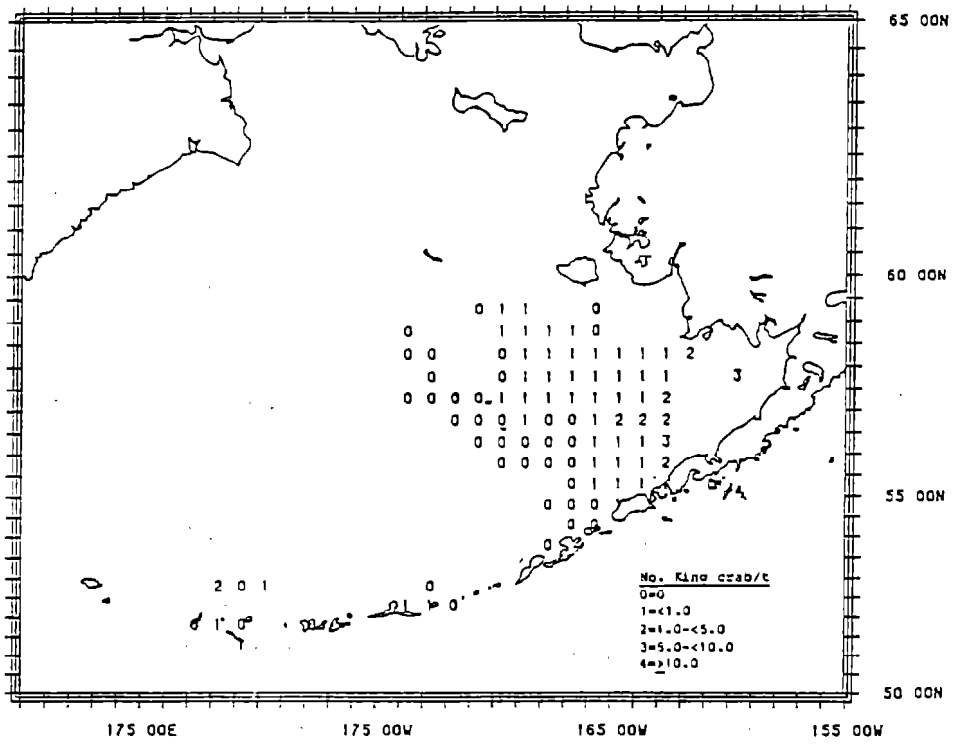


KING CRAB INCIDENCE 1986 FOURTH QUARTER LARGE FREEZER TRAWLERS

Figure 16.--Continued.

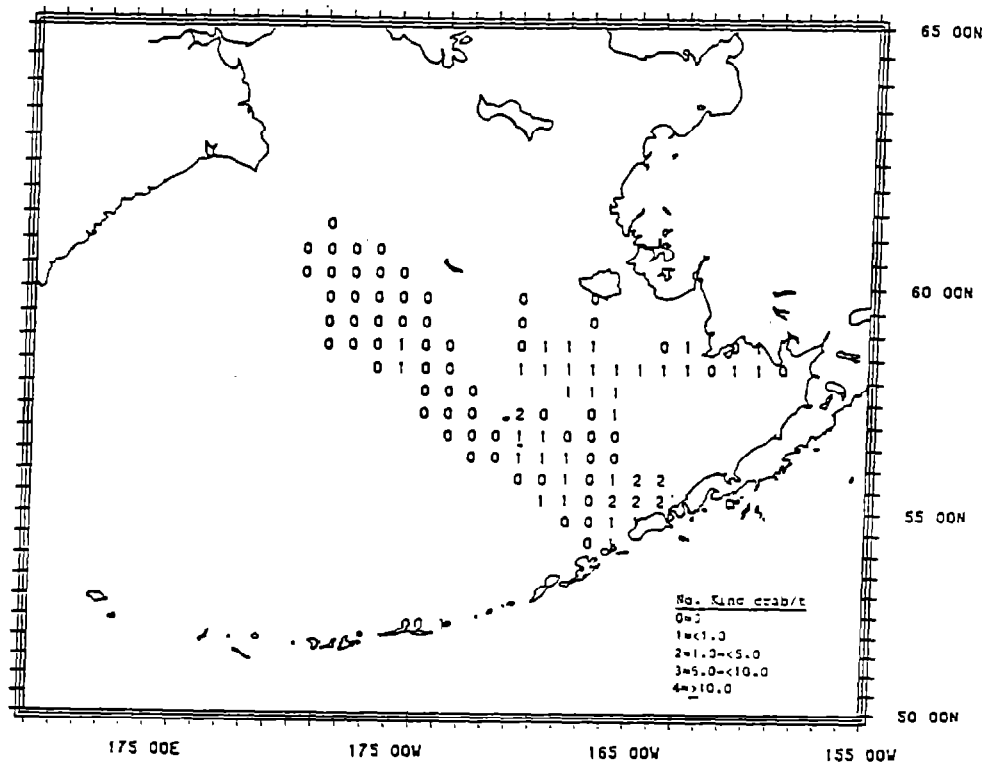


KING CRAB INCIDENCE 1986 FIRST QUARTER JOINT VENTURE VESSELS

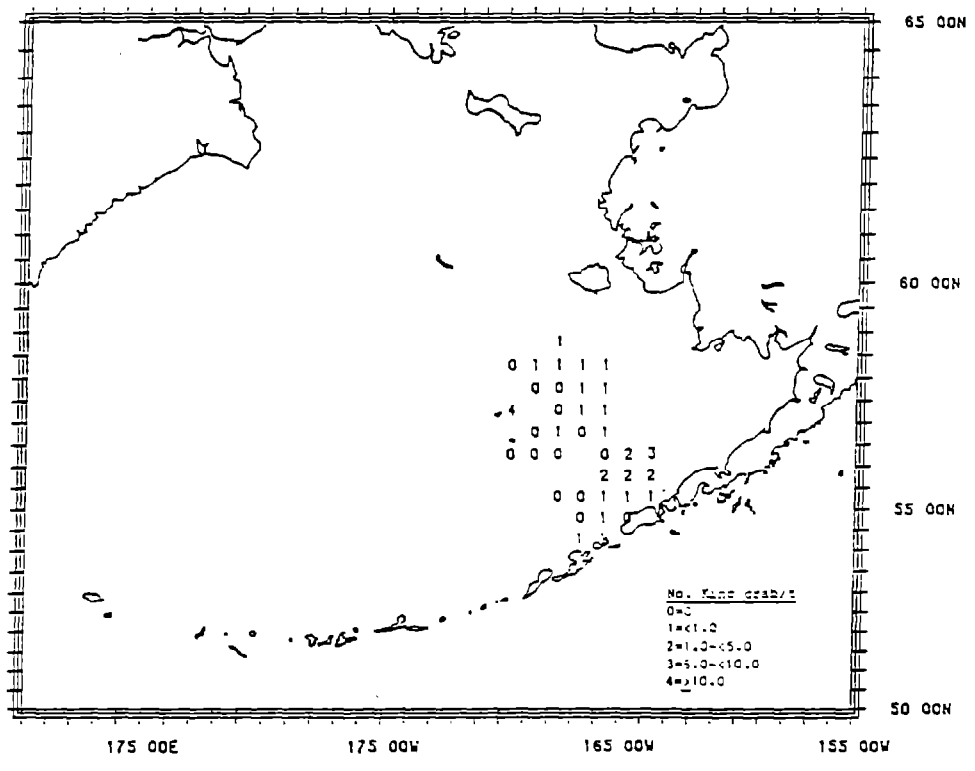


KING CRAB INCIDENCE 1986 SECOND QUARTER JOINT VENTURE VESSELS

Figure 17.--Average incidence (no-/t) of king crab in the joint venture fisheries by quarter and 1/2° lat. by 1° long. areas, 1986.



KING CRAB INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS



KING CRAB INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 17. --Continued.

SUMMARY OF OBSERVER SAMPLING FOR THE GULF OF ALASKA REGION

Observer Coverage of Fishing Fleets

During 1986, the only vessels fishing on foreign quotas in the U.S. 200-mile EEZ in the Gulf of Alaska region (Fig. 18) were Japanese longliners. The 1986 level of foreign fishing effort (666 days) (Table 26) is 3% lower than that spent in 1985 (Berger et al. 1987), continuing the trend of decreased foreign fishing in the Gulf of Alaska. United States fisheries observers spent 657 days sampling aboard these foreign vessels, resulting in an observer coverage (100 x number of observer days/number of foreign vessel days) of 98.6%. This is a 5.3% increase over the 1985 level of coverage (Berger et al. 1987).

The effort of foreign vessels participating in joint ventures with U.S. catcher boats in 1986 was lower (down 75%) than in 1985. A reduction in the optimum yield of pollock in the Gulf of Alaska led to a substantial reduction in the amount of pollock allocated to be caught in the Shelikof Strait joint venture fishery. This resulted in foreign vessels spending only 582 days in joint venture fishing operations. These joint ventures were conducted between U.S. vessels and processing vessels from Japan, Poland, the Republic of Korea (ROK), and the People's Republic of China (PRC). Observers spent 567 days sampling aboard these foreign processing vessels, providing an observer coverage of 97.4%.

A total of 1,224 of the 1,248 vessel days (foreign and joint venture fisheries combined) were sampled by observers in 1986, making an overall percent coverage of 98.1%. In 1985, the overall percent coverage by observers was 91.3%.

Estimates of Foreign and U.S. Joint Venture Catches

The total estimated catch by foreign vessels in the Gulf of Alaska in 1986 was approximately 15,500 t (Table 271, all by Japanese longliners. The Pacific ocean perch complex, the other rockfish complex, and sablefish were declared prohibited species for the foreign and joint venture fisheries in 1986 since essentially all of the allowable catch was set aside for the U.S. domestic fishery (excluding joint venture fisheries). Prohibited species catch (PSC) limits were established for each of these three management groups for the foreign fishery and though the catches of these species could not be retained, catches in excess of the PSC limits could close the target fishery. Foreign vessels were only allowed to target on Pacific cod in 1986. The catches of Pacific cod accounted for almost 98% of the foreign catch in 1986.

In 1986, a total of almost 65,300 t of groundfish were landed in the U.S. joint venture fisheries (Table 27). Walleye pollock constituted almost 96% of the joint venture catch. The catches of Pacific cod and flatfish composed most of the remaining portions of the catch. The majority of the pollock caught in joint venture fisheries were taken in the fisheries conducted in the

Shelikof Strait in February and March (51,800 t), whereas the catches of the other species were taken in various fisheries conducted in the Shumagin, Chirikof, and Kodiak areas throughout the year.

Table 28 presents a summary of the foreign and joint venture catches by species for the years 1977 to 1986. The 1986 total foreign catch of about 15,500 t represents a decrease of about 62% from the estimated catch of 41,000 t in 1985. The 1986 U.S. joint venture groundfish catch decreased 73.6% from 1985, and was the lowest joint venture catch since 1981. This is in sharp contrast to the rapid growth of joint ventures in recent years, and reflects lower allocations due to a reduction in the optimum yield of pollock in the Gulf of Alaska. The 1986 total estimated removal of fish from the Gulf of Alaska in foreign and joint venture fisheries amounted to 80,834 t, a 72.0% decrease from the estimated removal in 1985 of 288,205 t.

Incidence and Incidental Catch of Prohibited Species

Pacific Salmon

Incidental catches of salmon occurred in groundfish catches made by joint venture vessels in the Shumagin, Chirikof, and Kodiak areas in 1986. The incidence and average weights of salmon taken in catches sampled by observers are listed in Table 29. Salmon catches in the Shumagin and Chirikof areas were generally lower than 0.100 fish/t. In the Kodiak area, however, much higher incidence rates occurred for all the joint venture operations in March, October, November, and December. This resulted in an overall estimated annual incidence rate of 1.289 salmon/t in joint venture fishery operations in the Kodiak area.

The incidence of salmon by l/2° latitude by l° longitude statistical block is illustrated for joint venture vessels in Figure 19. Four occurrences of over three salmon/t were observed on joint venture vessels. These all occurred in the fourth quarter near Kodiak Island (56°00'-57°30'N lat., 149°-152°W long.). These incidental catches occurred while targeting on pollock with midwater or pelagic trawl gear.

The estimated incidental catches of salmon, by area and vessel class, are shown in Table 30. The foreign groundfish fishery was estimated to have taken no salmon in 1986. The 1986 estimated catch in the joint venture fishery was more than 20,800 salmon. Over 94.0% of the salmon were taken in the Kodiak area, 5.0% of the salmon were caught in the Chirikof area, and 1.0% were caught in the Shumagin area. The incidental catch in the 1986 joint venture operations was 51.6% higher than that taken in 1985 (Table 31). As in 1985, most of the incidental salmon catch in 1986 (88%) occurred in a pollock fishery conducted during the fourth quarter of the year. Even though the size of this fishery was reduced in 1986, substantial increases in the incidental catch rates of salmon caused an increase in the salmon landings.

The species composition and average length of the salmon species are given in Table 32. Three species of salmon were identified in the joint venture fishery, but chinook salmon (99.7%) predominated. Chum salmon made up

0.26% of the catch and coho salmon accounted for 0.03%. Chinook salmon had an average weight of 2.6 kg and an average length of 52.9 cm.

Pacific Halibut

Table 33 lists the incidence of halibut in foreign and joint venture catches by nation and vessel class and, in the longline fishery, by depth of fishing. Japanese longline vessels only fished in waters shallower than 500 m (usually between 100 and 300 m) in 1986, targeting on Pacific cod. The mean annual incidence of halibut for the longline fishery was 5.1 halibut/t in the Shumagin area and 14.3 halibut/t in the Chirikof area.

Halibut incidence varied widely among the different joint venture operations by area and month. The incidence of halibut in the pollock joint venture fisheries conducted in the Shelikof Strait (February and March in the Kodiak and Chirikof area) were generally low (<0.05 halibut/t). In contrast, the incidence of halibut in joint venture fisheries other than the Shelikof Strait pollock fishery generally averaged from 1 to 12 halibut/t with monthly rates as high as 33 halibut/t observed. The non-Shelikof Strait fisheries operations usually targeted on a number of different species including pollock, Pacific cod, and flatfish.

The incidence of halibut by l/2° latitude by l° longitude block is illustrated by quarter of the year for longline vessels and for the joint venture fisheries (Figs. 20-21). The incidence of halibut in the foreign longline fishery (Fig. 20) exceeded 10 halibut/t in most areas fished during the first and second quarters. There was no fishing conducted by longline vessels during the second half of the year. In the joint venture fisheries (Fig. 21), incidence rates greater than 5 halibut/t occurred in the first and third quarters south and southeast of Kodiak Island (56°00'-57°30'N lat., 151°-155°W long.). In the fourth quarter, incidence rates were between 1 and 5 halibut/t throughout the fishery. Very little joint venture activity took place in the second quarter.

The estimated incidental catches of Pacific halibut, by area and vessel class, are shown in Table 34. The foreign groundfish fishery (Japanese longliners) took approximately 116,200 halibut (384 t) in 1986. Halibut landings were evenly split between the Shumagin and Chirikof areas (53.1% and 46.9%, respectively). In 1986, the joint venture incidental catch of halibut was 27,432 fish, most of which were caught in the Shumagin area (56.3%). Table 35 presents a summary of the foreign and joint venture incidental catches of Pacific halibut for the years 1977 to 1986. The 1986 total foreign catch of about 116,200 halibut (384 t) is a decrease in numbers of fish of about 7% from the 1985 catch of 124,800 (241 t), but had a 59% increase in weight. Most of the decrease in numbers was due to the curtailment of all foreign fishing by vessels other than longliners and the overall reduction in foreign fishing effort. Decreased effort by the joint venture operations also led to a decrease in the joint venture catch of halibut. The 1986 joint venture halibut catch was 27,400 fish (89.3 t), a decrease of 65.0% by number

and 70.3% by weight from that of 1985. The total halibut catch by the foreign and joint venture fisheries of 143,652 fish is the lowest catch since the MFCMA was implemented in 1977.

Halibut hooked in the 1986 longline fishery averaged 3.6 kg in the Shumagin area and 3.0 kg in the Chirikof area. Halibut caught in the joint venture fisheries averaged 3.4 kg in the Shumagin area, 2.9 kg in the Chirikof area, and 3.1 kg in the Kodiak area. Average lengths of halibut by area (foreign and joint venture combined) were as follows: Shumagin, 61.2 cm; Chirikof, 64.5 cm; and Kodiak, 51.6 cm. Halibut taken in the longline fishery had an average length of 62.4 cm, and those measured from joint venture catches averaged 60.5 cm in length.

Snow (Tanner) Crab

Table 36 presents the incidence of Tanner crab in foreign and joint venture catches by nation, vessel class, and (in the longline fishery) depth of fishing. The incidence of Tanner crab in the 1986 longline fisheries was less than 0.2 crab/t. In the joint venture fishery, the incidence of Tanner crab varied by operation and area. Tanner crab incidence was high in catches made in the U.S.-Poland joint venture fishery in the Shumagin (3.625 crab/t), and Kodiak (5.418 crab/t) areas. Incidence rates of Tanner crab exceeding 1.0 crab/t were also observed in the Kodiak area in the U.S.-Japan and U.S.-PRC joint ventures. In the remaining joint venture operations, the average annual incidence of Tanner crab was less than 0.05 crab/t.

The incidence of Tanner crab in joint venture catches is shown by l/2° latitude and l° longitude block by quarter in Figure 22. In the first quarter, one instance of 25 crab/t or greater (56°30'N lat., 153°W long.) and one instance of l0-25 crab/t (57°00'N lat., 152°W long.) were observed. In the third quarter, one instance of 25 crab/t or greater (57°00'N lat., 152°W long.) and one instance of l0-25 crab/t (56°30'N lat., 152°W long.) were also observed. In the fourth quarter, two locations had rates of l-10 crab/t (56°30'N lat., 152°W long.; 54°00'N lat., 164°W long.). In all other areas, the incidence rates of Tanner crab were below 1 crab/t.

The total estimated catch of Tanner crab was approximately 1,425 crab or about 1.2 t (Table 37) in the foreign groundfish fishery. The joint venture fishery caught less than 11,800 Tanner crab, 99.0% of the catch occurring in the Kodiak area. The 1986 incidental catch of Tanner crab (foreign and joint venture fisheries combined) was 80% lower than that of 1985 (Table 38), even though the total foreign catch of 1,425 Tanner crab represents a 180% increase over the 1985 catch of 509 crab. The overall decrease was due to the decreased effort by joint venture vessels in the Gulf of Alaska. The total catch of Tanner crab (13,200 crab) was the lowest recorded catch for the years 1978-86.

The species composition and average size of the Tanner crab are given in Table 39. As in 1985, only two species of Tanner crab were identified in the 1986 foreign fishery: Chionoecetes bairdi and C. opilio. Chionoecetes

tanneri are typically caught by longliners fishing in deep water, and have been avoided the last 2 years due to regulations resulting in only shallow-water longline operations. In 1986, C. bairdi and C. opilio formed 98.65% and 1.35% of the catch, by number, respectively. In the joint venture fishery as well, only two species of Tanner crab were identified. Chionoecetes bairdi made up 97.41% of the total crab catch; C. opilio (2.59%) accounted for the remainder.

King Crab

Table 40 gives the incidence of king crab in the 1986 foreign groundfish and joint venture fisheries by vessel class and area. No king crab were caught in the foreign fishery. In the joint venture fishery, the mean annual incidence rates ranged from 0 to 0.007 crab/t. The highest monthly incidence rates in the joint venture fishery were in the U.S .-Japan operation in the Kodiak area in September (0.159 crab/t). No other joint venture operation had a monthly incidence rate higher than 0.06 crab/t.

The estimated incidental catches of king crab, by area and vessel class, are shown in Table 41. No king crab were taken in the 1986 foreign groundfish fishery. The joint venture fishery landed an estimated 33 king crab in 1986 compared to 2,400 caught in 1985. Most of the king crab were taken in the Kodiak (75.8%) and Shumagin (21.2%) areas. One crab came from the Chirikof area. Table 42 presents a summary of the foreign and joint. venture incidental catches of king crab for the years 1978 to 1986. The combined foreign and joint venture incidental king crab catch of 33 crab (0.08 t) is the lowest catch by numbers and weight since the implementation of the MFCMA in 1977.

The species composition and average size of the king crab are given in Table 43. Two species of king crab were identified in the 1986 groundfish catches, red king crab and blue king crab. In the foreign fishery, the continued reduction of the foreign fishing effort and the restrictions on target species resulted in no king crab being caught. In the joint venture fishery, 93.1% of the king crab taken were red king crab. Blue king crab (6.9%) accounted for the rest.

Rockfish Catch by Species

Table 44 lists the common and scientific names of the 17 species of rockfish that were identified by observers as appearing in foreign or joint venture catches in the Gulf of Alaska during 1986. In this table, and in Table 45, the group "other rockfish" consists of 8 species which make up a relatively small amount of the rockfish catch.

The rockfish catch data by nation and vessel class were combined for each area and are presented in Table 45. As previously mentioned, the catches of rockfish by foreign and joint venture fisheries were limited by the establishment of these species as "prohibited species" for foreign and joint venture fisheries in 1986 and the setting of prohibited species catch limits

for these species. These regulatory changes and the curtailment of foreign trawling operations resulted in large decreases in the catches of rockfish in 1986. Approximately 4.2 t of rockfish were estimated to have been taken by foreign fishing vessels in the Gulf of Alaska in 1986, down about 68.7% from the 13.4 t in 1985 and down 99.9% from the 3,200 t caught in 1984 prior to the "prohibited species" restrictions (Berger et a1. 1987). The catch of dusky rockfish (1.4 t) and yelloweye rockfish (Sebastes rubberrimus)(1.05 t) represented 34.4% and 25.1%, respectively, of the total rockfish catch by foreign nations. The largest percentage of rockfish (76.1%) was landed in the Shumagin area. The Chirikof area accounted for 23.9% of the rockfish catch. In 1986, joint venture operations landed 66.5 t of rockfish (down 78.4% from 1985). Over 92.1% of the catch occurred in the Shumagin area, 5.5% in the Chirikof area, and 2.4% in the Kodiak area. Pacific ocean perch (53.0%), dusky rockfish (22.8%), and northern rockfish (15.9%) accounted for most of the catch.

Flatfish Catch by Species

Table 46 lists the common and scientific names of the 15 species of flatfish that were identified by observers as appearing in foreign or joint venture catches in the Gulf of Alaska in 1986. Arrowtooth flounder was the predominant flatfish in foreign groundfish catches in all areas, making up almost 78.8% of the total estimated foreign flatfish catch of about 70.5 t (Table 47). Flathead sole (Hippoglossoides elassodon and rock sole (Lepidopsetta bilineata) made up 12.4% and 5.4% of the catch, respectively. The largest percentage of flatfish (78.9%) was landed in the Shumagin area. The Chirikof area accounted for 21.1%. Joint venture operations targeting on flatfish caught 960 t in 1986, a 60% decrease from 1985. The Kodiak area accounted for 61.8% of the flatfish catch, with the Shumagin and Chirikof areas yielding 31.4% and 6.8% of the catch, respectively. In 1986, arrowtooth flounder made up the largest percentage of the joint venture flatfish catches (53.5%). Rock sole, butter sole, flathead sole (Isopsetta isolepis), and rex sole (Glyptocephalus zachirus) were also important, making up 22.1%, 9.0%, 6.2%, and 4.3% of the catch, respectively.

Table 26.--Percent observer coverage of the foreign and joint venture fisheries in the Gulf of Alaska, 1986.

Nation	Vessel class	No. of observers	No. of ships observed	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage[a]
Japan	Longline	25	22	22	657	666	98.6
Total - Foreign Fishery		25	22	22	657	666	98.6
U.S.-Japan	Other SJV		12	12	200	201	99.5
U.S.-Japan	Longline Cod LLJV		2	2	31	31	100.0
U.S.-Japan	Other FJV		5	6	55	62	88.7
U.S.-Japan	Yell/Flat FJV		2	2	23	25	92.0
U.S.-Japan	Total Joint Venture	22	21	22	309	319	96.9
U.S.-ROK	Other FJV		15	15	138	142	97.2
U.S.-ROK	Yell/Flat FJV		1	1	1	1	100.0
U.S.-ROK	Total Joint Venture	16	16	16	139	143	97.2
U.S.-Poland	Other FJV	5	5	5	49	50	98.0
U.S.-PRC	Other FJV	3	3	3	70	70	100.0
Total - Joint Venture Fishery[b]		46	45	46	567	582	97.4
Grand Total		71	65[c]	66[c]	1,224	1,248	98.1

[a] Percent coverage = 100 x (observer days/vessel days).

[b] In the joint venture fisheries, only the Foreign processing vessels are indicated for the number of ships and vessel days--the U.S. catcher boats are not included.

c Two vessels participated in both the directed and joint venture fisheries and were, therefore, only counted once within the total.

SJV = Surimi joint venture
PJV = Freezer joint venture
LLJV = Longline vessel acting as a joint venture processor
ROK = Republic of Korea
Yell/Flat = Targetting on yellowfin sole/flatfish
Other = Targetting on roundfish
PRC = Peoples's Republic of China

Table 27.--Estimated foreign and joint venture catch in the Gulf of Alaska groundfish fishery, 1986.

Species groups	Foreign catches (metric tons) Japan	Total	Percent	U.S. Joint ventures (metric tons)	Percent
Squid	0.0	0.0	0.0	6.8	<0.1
All flounders	70.5	70.5	0.5	961.1	1.5
Pollock	113.9	113.9	0.7	62,591.4	95.9
Pacific cod	15,210.5	15,210.5	97.8	1,356.6	2.1
Sablefish	1.4	1.4	<0.1	45.3	0.1
Atka mackerel	<0.1	<0.1	<0.1	4.0	<0.1
Ocean perch species[a]	1.5	1.5	<0.1	49.4	0.1
Thornyhead rockfish	0.0	0.0	0.0	1.0	<0.1
Other rockfish	2.7	2.7	<0.1	16.1	<0.1
Other fish[b]	146.2	146.2	0.9	255.1	0.4
Total	15,546.7	15,546.7		65,286.8	

[a] Catches of rougheye, shortraker, northern, and sharpchin rockfish were reported combined with Pacific ocean perch in 1986.

[b] "Other fish" does not include the catch of rattails, Coryphaenoides spp., which foreign vessels were not required to report in 1986, unless they retained them.

Table 28.--Estimated foreign and joint venture catches by species group in the Gulf of Alaska, 1977-86[a].

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Foreign directed catches (metric tons)										
Squid	NA	322	425	841	1,135	278	267	120	6	0
Flounders	16,038	14,314	13,474	15,497	14,443	8,986	9,531	3,033	170	71
Pollock	117,834	96,392	103,187	112,997	130,324	92,612	81,358	99,260	31,587	114
Pacific cod	1,988	11,371	13,174	34,245	34,969	26,936	29,777	15,897	9,086	15,211
Sablefish	15,957	7,128	6,885	6,139	7,975	5,645	4,965	1,108	38	1
Atka mackerel	19,455	19,588	10,948	13,163	18,727	6,760	11,470	537	2	<1
All rockfish[b]	23,578	10,070	12,286	16,647	17,857	10,468	7,846	3,177	14	4
Other fish[c]	4,642	5,989	2,971	8,515	7,112	2,049	2,255	576	97	146
Total	199,492	165,174	163,350	208,044	232,542	153,734	147,469	123,708	41,000	15,547
Joint-venture catches (metric tons)										
Squid		0	<1	0	<1	16	4	5	7	7
Flounders		5	70	209	18	18	2,692	3,449	2,447	961
Pollock		34	566	1,136	16,857	73,917	134,131	207,104	237,860	62,591
Pacific cod		7	713	466	58	193	2,426	4,649	2,266	1,357
Sablefish		0	18	20	<1	1	275	528	226	45
Atka mackerel		<1	1	3	0	0	790	585	1,846	4
All rockfish[b]		1	90	28	1	3	2,276	2,037	307	67
Other fish[c]		1	34	49	33	301	391	1,268	2,246	255
Total	[d]	48	1,492	1,911	16,967	74,449	142,985	219,625	247,205	65,287

[a] Estimates for years1977-85 are from Berger et al. 1987.

[b] As rockfish reporting requirements have changed over the years, for comparison purposes, all rockfish are combined into a single group.

[c] Reporting requirements of rattails, Coryphaenoides spp., have changed. In 1978, rattails were included in the "other fish" category. In 1980, rattails were reported in a separate category, and in this table, rattails make up 2,960 t of the 1980 foreign catches of "other fish". No rattails were estimated to have been taken in the 1980 joint venture fishery. In the other years, foreign nations were not required to report them unless they were utilized.

[d] Joint venture activity did not begin until 1978.

Table 29.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Longliners Fishing <500 m						
Jan.	--	--	--	--	--	--
Feb.	0.000	0.000	0.000	0.000	--	--
March	0.000	0.000	0.000	0.000	--	--
April	0.000	0.000	0.000	0.000	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.000	0.000	0.000	--	--
U.S.-Republic of Korea JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	0.000	0.000	0.018	1.737	0.095	1.177
March	0.000	0.000	0.102	2.142	0.393	0.533
April	NS	NS	--	--	--	--
May	0.000	0.000	--	--	--	--
June	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--
Aug.	0.000	0.000	--	--	--	--
Sep.	0.024	4.885	--	--	--	--
Oct.	0.034	4.866	--	--	--	--
Nov.	0.007	5.200	--	--	--	--
Dec.	0.000	0.000	--	--	--	--
Annual	0.028	4.872	0.024	1.855	0.128	0.957

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 29.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.026	2.271	0.106	1.634
March	0.074	1.475	0.047	2.223	0.333	0.921
April	0.000	0.000	--	--	NS	NS
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	0.000	0.000	0.000	0.000	--	--
Sep.	0.041	4.159	0.000	0.000	0.099	2.087
Oct.	0.000	0.000	--	--	4.056	2.018
Nov.	--	--	--	--	4.164	3.617
Dec.	--	--	--	--	--	--
Annual	0.037	2.965	0.027	2.264	1.075	2.749
U.S.-Poland JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	0.263	1.120	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.082	2.600	--	--	--	--
Nov.	--	--	--	--	3.227	2.116
Dec.	--	--	--	--	1.665	2.169
Annual	0.125	1.860	0.000	0.000	2.729	2.118

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 29.--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	0.010	4.342	--	--	0.591	1.412
Dec.	0.065	2.552	--	--	--	--
Annual	0.023	3.116	--	--	0.591	1.412

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

Table 30.--Estimated incidental catches of Pacific salmon (in numbers of fish and metric tons) by foreign groundfish and joint venture vessels in the Gulf of Alaska, 1986.

	Number of fish				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Foreign groundfish vessels								
Japan LL	0	0	-	0	0.00	0.00	-	0.00
Joint venture vessels								
U.S.-Japan	9	888	17,834	18,731	0.03	2.01	47.17	49.21
U.S.-ROK	85	154	148	387	0.41	0.27	0.17	0.85
U.S.-Poland	1	0	1,543	1,544	<0.01	0.00	3.27	3.27
U.S.-PRC	105	-	53	158	0.32	-	0.07	0.39
Joint venture total	200	1,042	19,578	20,820	0.76	2.28	50.68	53.72
Percent by area	0.96	5.00	94.04		1.42	4.24	94.34	

LL = Longline vessels

Table 31. --The estimated incidental catch (numbers and metric tons) of Pacific salmon in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-86[a].

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	5,272	19.30	NF	NF	5,272	19.30
1978	45,603	131.27	b	b	45,603	131.27
1979	20,410	68.69	1,050	2.31	21,460	71.00
1980	35,901	106.90	168	1.07	36,069	107.97
1981	30,860	95.89	0	0.00	30,860	95.89
1982	5,556	18.89	1,411	2.77	6,967	21.66
1983	9,621	31.76	4,253	11.98	13,874	43.74
1984	12,001	36.13	63,845	168.97	75,846	205.10
1985	365	1.64	13,737	38.86	14,102	40.50
1986	0	0.00	20,820	53.72	20,820	53.72

[a] Estimates for years 1977-85 are from Berger et al. 1987.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

Table 32.--Biological data on the incidental catch of Pacific salmon in the joint venture groundfish fishery in the Gulf of Alaska, 1986*.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Chinook	99.71	Male	48.84	2.46	52.6
		Female	50.53	2.68	53.3
		Unsexed	0.63	1.73	50.3
		Combined		2.57	52.9
Chum	0.26	Male	69.22	3.29	63.4
		Female	30.78	2.37	56.5
		Unsexed	0.00	--	--
		Combined		3.01	61.3
Coho	0.03	Male	50.00	1.53	48.0
		Female	50.00	1.67	51.0
		Unsexed	0.00	--	--
		Combined		1.60	49.5

* No salmon were caught in the foreign groundfish fishery.

Table 33. --Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Averag weight
Japanese Longliners Fishing <500 m						
Jan.	--	--	--	--	--	--
Feb.	6.024	2.950	39.967	3.391	--	--
March	2.803	3.269	12.098	3.711	--	--
April	19.018	3.716	27.389	3.228	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	5.078	3.050	14.329	3.623	--	--
U.S.-Republic of Korea JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	0.000	0.000	0.015	6.649	0.002	1.1(
March	0.000	0.000	0.004	2.000	0.000	0.0(
April	NS	NS	--	--	--	--
May	1.296	2.114	--	--	--	--
June	4.803	2.295	--	--	--	--
July	--	--	--	--	--	--
Aug.	5.147	3.609	--	--	--	--
Sep.	1.601	4.549	--	--	--	--
Oct.	1.323	4.598	--	--	--	--
Nov.	3.596	3.163	--	--	--	--
Dec.	5.057	2.628	--	--	--	--
Annual	1.653	4.017	0.014	6.568	0.002	1.1(

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 33.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.016	3.880	0.339	2.519
March	0.000	0.000	0.023	4.259	9.241	1.299
April	0.000	0.000	--	--	NS	NS
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	0.000	0.000	0.000	0.000	--	--
Sep.	0.033	10.740	33.127	1.842	11.436	2.914
Oct.	1.805	3.036	--	--	0.976	4.784
Nov.	--	--	--	--	0.100	4.638
Dec.	--	--	--	--	--	--
Annual	0.167	3.787	0.080	2.277	1.184	2.277
U.S.-Poland JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	8.947	2.698	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	13.525	2.590	--	--	--	--
Nov.	--	--	--	--	1.947	4.379
Dec.	--	--	--	--	24.675	3.721
Annual	12.438	2.608	0.000	0.000	2.939	4.077

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 33.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	2.175	3.150	--	--	5.121	3.456
Dec.	3.568	3.097	--	--	--	--
Annual	2.516	3.132	--	--	5.121	3.456

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

Table 34.--Estimated incidental catches of Pacific halibut (in numbers of fish and metric tons) by foreign groundfish and joint venture vessels in the Gulf of Alaska, 1986.

	Number of fish				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Foreign groundfish vessels								
Japan LL	61,757	54,463	-	116,220	187.58	196.81	-	384.39
Percent by area	53.14	46.86	-		48.80	51.20	-	
Joint venture vessels								
U.S.-Japan	4	1,483	8,125	9,612	0.04	3.87	22.94	26.85
U.S.-ROK	4,992	117	3	5,112	20.09	0.78	<0.01	20.87
U.S.-Poland	34	0	1,802	1,836	0.09	0.00	7.29	7.38
U.S.-PRC	10,413	-	459	10,872	32.58	-	1.59	34.17
Joint venture total	15,443	1,600	10,389	27,432	52.80	4.65	31.82	89.27
Percent by area	56.30	5.83	37.87		59.15	5.21	35.64	

LL = Longline vessels

Table 35.--The estimated incidental catch (numbers and metric tons) of Pacific halibut in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-86[a].

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1977	413,009	2,200	NF	NF	413,009	2,200
1978	293,374	1,289	b	b	293,374	1,289
1979	249,641	2,576	5,127	21.49	254,768	2,597
1980	511,521	3,205	19,318	48.50	530,839	3,254
1981	417,311	2,499	274	4.81	417,585	2,504
1982	562,196	2,690	2,371	3.60	564,567	2,694
1983	689,688	3,235	98,571	356.49	788,259	3,592
1984	361,913	1,506	165,721	589.66	527,634	2,096
1985	124,786	241	78,484	300.30	203,270	541
1986	116,220	384	27,432	89.27	143,652	473

[a] Estimates for years 1977-85 are from Berger et al. 1987.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

NF = No fishing.

Table 36.--Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Longliners Fishing <500 m						
Jan.	--	--	--	--	--	--
Feb.	0.069	0.867	0.070	0.533	--	--
March	0.043	0.861	0.185	0.752	--	--
April	0.040	1.100	0.377	1.104	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.060	0.868	0.185	0.775	--	--
U.S.-Republic of Korea JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	0.000	0.000	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000	0.000	0.000
April	NS	NS	--	--	--	--
May	0.000	0.000	--	--	--	--
June	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--
Aug.	1.471	0.380	--	--	--	--
Sep.	0.152	0.320	--	--	--	--
Oct.	0.001	0.159	--	--	--	--
Nov.	0.000	0.000	--	--	--	--
Dec.	0.000	0.000	--	--	--	--
Annual	0.020	0.335	0.000	0.000	0.000	0.000

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 36. --Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.001	0.142	0.002	0.090
March	0.000	0.000	0.000	0.000	7.896	0.323
April	0.000	0.000	--	--	NS	NS
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	0.000	0.000	0.000	0.000	--	--
Sep.	0.033	0.105	0.000	0.000	21.632	0.584
Oct.	0.293	0.028	--	--	2.419	0.453
Nov.	--	--	--	--	0.000	0.000
Dec.	--	--	--	--	--	--
Annual	0.041	0.059	0.001	0.142	1.275	0.459
U.S.-Poland JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	4.754	0.170	--	--	--	--
Nov.	--	--	--	--	4.419	0.268
Dec.	--	--	--	--	33.053	0.595
Annual	3.625	0.170	0.000	0.000	5.418	0.377

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 36.-- Incidence (number per metric ton of catch) and average weight (kg) of Tanner crab taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	0.001	0.043	--	--	2.929	0.135
Dec.	0.000	0.000	--	--	--	--
Annual	0.001	0.043	--	--	2.929	0.135

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

Table 37.--Estimated incidental catches of Tanner crab (in numbers of crab and metric tons) by foreign groundfish and joint venture vessels in the Gulf of Alaska, 1986.

	Number of crab				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all area
Foreign groundfish vessels								
Japan								
LL	719	706	-	1,425	0.62	0.55	-	1.17
Percent by area	50.46	49.54	-		52.99	47.01	-	
Joint venture vessels								
U.S.-Japan	4	44	8,137	8,185	<0.01	0.01	3.42	3.43
U.S.-ROK	66	0	0	66	0.02	0.00	0.00	0.02
U.S.-Poland	0	0	3,245	3,245	0.00	0.00	1.27	1.27
U.S.-PRC	3	-	263	266	<0.01	-	0.04	0.04
Joint venture total	73	44	11,645	11,762	0.02	0.01	4.73	4.76
Percent by area	0.62	0.37	99.01		0.42	0.21	99.37	

LL = Lonyline vessels

Table 38.--Estimated incidental catches (numbers and metric tons) of Tanner crab in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1978-86[a].

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1978	23,969	14.16	b	b	23,969	14.16
1979	16,992	11.30	626	0.25	17,618	11.55
1980	27,844	16.62	58,022	14.43	85,866	31.05
1981	96,662	70.19	0	0	96,662	70.19
1982	63,293	35.33	364	0.17	63,657	35.50
1983	30,609	22.42	102,840	54.87	133,449	77.29
1984	8,885	5.69	41,663	27.36	50,548	33.05
1985	509	0.28	64,640	16.61	65,149	16.89
1986	1,425	1.17	11,762	4.76	13,187	5.93

[a] Estimates for years 1978-85 are from Berger et al. 1987.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

Table 39. --Biological data on the incidental catch of Tanner crab in the foreign and joint venture groundfish fishery in the Gulf of Alaska, 1986.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average width (mm)
Foreign directed fisheries					
Chionoecetes bairdi	98.65	Male	95.44	0.85	138
		Female	4.07	0.29	86
		Unsexed	0.49	0.75	134
		Combined		0.83	136
Chionoecetes opilio	1.35	Male	82.37	0.70	114
		Female	17.63	1.00	131
		Unsexed	0.00	--	--
		Combined		0.75	117
Joint venture fisheries					
Chionoecetes bairdi	97.41	Male	52.70	0.51	113
		Female	47.30	0.23	83
		Unsexed	0.00	--	--
		Combined		0.38	99
Chionoecetes opilio	2.59	Male	72.52	0.32	80
		Female	27.48	0.30	70
		Unsexed	0.00	--	--
		Combined		0.32	77

Table 40.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Japanese Longliners Fishing <500 m						
Jan.	--	--	--	--	--	--
Feb.	0.000	0.000	0.000	0.000	--	--
March	0.000	0.000	0.000	0.000	--	--
April	0.000	0.000	0.000	0.000	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	--	--	--	--	--	--
Dec.	--	--	--	--	--	--
Annual	0.000	0.000	0.000	0.000	--	--
U.S.-Republic of Korea JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	0.000	0.000	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000	0.000	0.000
April	NS	NS	--	--	--	--
May	0.000	0.000	--	--	--	--
June	0.000	0.000	--	--	--	--
July	--	--	--	--	--	--
Aug.	0.000	0.000	--	--	--	--
Sep.	0.019	1.763	--	--	--	--
Oct.	0.000	0.000	--	--	--	--
Nov.	0.000	0.000	--	--	--	--
Dec.	0.000	0.000	--	--	--	--
Annual	0.001	1.763	0.000	0.000	0.000	0.000

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 40.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Japan JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000	0.054	1.556
April	0.000	0.000	--	--	NS	NS
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	0.000	0.000	0.000	0.000	--	--
Sep.	0.000	0.000	0.033	4.500	0.159	2.567
Oct.	0.000	0.000	--	--	0.003	4.400
Nov.	--	--	--	--	0.000	0.000
Dec.	--	--	--	--	--	--
Annual	0.000	0.000	<0.001	4.500	0.007	2.206
U.S.-Poland JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	0.000	0.000	0.000	0.000
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	0.000	0.000	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	0.003	6.400
Dec.	--	--	--	--	0.000	0.000
Annual	0.000	0.000	0.000	0.000	0.002	6.400

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

NS = Fishing occurred but no sampling by U.S. observers.

Table 40.--Incidence (number per metric ton of catch) and average weight (kg) of king crab taken in the foreign and joint venture (JV) groundfish catches in the Gulf of Alaska, 1986 (Continued)*. Lines indicate areas not fished.

	Shumagin		Chirikof		Kodiak	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Peoples Republic of China JV Mothership						
Jan.	--	--	--	--	--	--
Feb.	--	--	--	--	--	--
March	--	--	--	--	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	--	--	--	--	--	--
July	--	--	--	--	--	--
Aug.	--	--	--	--	--	--
Sep.	--	--	--	--	--	--
Oct.	--	--	--	--	--	--
Nov.	0.000	0.000	--	--	0.000	0.000
Dec.	0.000	0.000	--	--	--	--
Annual	0.000	0.000	--	--	0.000	0.000

* There was no foreign or joint venture fishing in the Yakutat or Southeastern INPFC areas in 1986.

Table 41.--Estimated incidental catches of king crab (in numbers of crab and metric tons) by foreign groundfish and joint venture vessels in the Gulf of Alaska, 1986.

	Number of crab				Weight (metric tons)			
	Shumagin	Chirikof	Kodiak	Total all areas	Shumagin	Chirikof	Kodiak	Total all areas
Foreign groundfish vessels								
Japan								
LL	0	0	-	0	0.00	0.00	-	0.00
Joint venture vessels								
U.S.-Japan	0	1	24	25	0.00	<0.01	0.06	0.06
U.S.-ROK	7	0	0	7	0.01	0.00	0.00	0.01
U.S.-Poland	0	0	1	1	0.00	0.00	0.01	0.01
U.S.-PRC	0	-	0	0	0.00	-	0.00	0.00
Joint venture total	7	1	25	33	0.01	<0.01	0.07	0.08
Percent by area	21.21	3.03	75.76		12.50	<0.01	87.50	

LL = Longline vessels

Table 42.--The estimated incidental catch (numbers and metric tons) of king crab in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1978-86[a].

Year	Foreign		Joint venture		Total	
	Nos.	t	Nos.	t	Nos.	t
1978	93,875	135.31	b	b	93,875	135.31
1979	24,094	40.30	466	0.83	24,560	41.13
1980	6,395	8.95	6,285	13.03	12,680	21.98
1981	6,619	8.01	0	0.00	6,619	8.01
1982	3,464	5.60	11	0.03	3,475	5.63
1983	2,124	3.00	4,454	15.01	6,578	18.01
1984	1,465	4.89	5,482	20.15	6,947	25.04
1985	10	0.01	2,427	7.69	2,437	7.70
1986	0	0.00	33	0.08	33	0.08

[a] Estimates for 1978-85 are from Berger et al. 1987.

[b] No estimates of incidental catch were made of the limited joint venture fishery in 1978.

Table 43.--Biological data on the incidental catch of king crab in the joint venture groundfish fishery in the Gulf of Alaska, 1986*.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (mm)
Red	93.06	Male	51.03	2.32	147
		Female	43.96	2.16	149
		Unsexed	5.02	3.20	170
		Combined		2.29	149
Blue	6.94	Male	100.00	5.61	194
		Female	0.00	--	--
		Unsexed	0.00	--	--
		Combined		5.61	194

* No king crab were caught in the foreign groundfish fishery.

Table 44. --The common and scientific names of rockfish identified in the 1986 foreign and joint venture catches in the Gulf of Alaska region.

Common name[a]	Scientific name
Black rockfish	*Sebastes melanops*
Dusky rockfish	*Sebastes ciliatus*
Harlequin rockfish	*Sebastes variegatus*
Northern rockfish	*Sebastes polyspinis*
Pacific ocean perch	*Sebastes alutus*
Rougheye rockfish	*Sebastes aleutianus*
Shortraker rockfish	*Sebastes borealis*
Shortspine thornyhead	*Sebastolobus alascanus*
Yelloweye rockfish	*Sebastes ruberrimus*
Other rockfish[b]	
Blue rockfish	*Sebastes mystinus*
Bocaccio	*Sebastes paucispinis*
Canary rockfish	*Sebastes pinniger*
Dark blotched rockfish	*Sebastes crameri*
Redbanded rockfish	*Sebastes babcocki*
Redstripe rockfish	*Sebastes proriger*
Stripetail rockfish	*Sebastes saxicola*
Widow rockfish	*Sebastes entomelas*

a With all rockfish, the possibility of misidentification exists, and the listing of species not previously reported from the Gulf of Alaska region should be noted with caution.

b The eight species listed under "Other rockfish" each accounted for less than 0.05 metric tons.

Table 45.--Estimated catch of rockfish by species and area in the Gulf of Alaska during 1986.

Common name	Shumagin t	Shumagin %	Chirikof t	Chirikof %	Kodiak t	Kodiak %	Total t	Total %
Foreign directed fisheries								
Black rockfish	0.11	3.65	0.00	0.00	--	--	0.11	2.63
Dusky rockfish	0.98	30.70	0.46	46.00	--	--	1.44	34.37
Northern rockfish	0.51	16.11	0.16	16.00	--	--	0.67	15.99
Pacific ocean Perch	0.14	4.26	<0.01	<0.01	--	--	0.14	3.34
Rougheye rockfish	0.05	1.52	0.02	2.00	--	--	0.07	1.67
Shortraker rockfish	0.60	18.84	0.02	2.00	--	--	0.62	14.80
Yelloweye rockfish	0.74	23.10	0.31	31.00	--	--	1.05	25.06
Other rockfish*	0.06	1.81	0.03	3.00	--	--	0.09	2.15
Total	3.19		1.00		--		4.19	
Percent by area	76.13		23.87		--			
Joint venture fisheries								
Black rockfish	0.01	0.02	0.00	0.00	0.01	0.55	0.02	0.03
Dusky rockfish	14.36	23.44	0.61	16.67	0.18	11.60	15.15	22.79
Harlequin rockfish	0.74	1.21	0.02	0.68	0.00	0.00	0.76	1.14
Northern rockfish	10.32	16.84	0.22	6.12	0.01	0.55	10.55	15.87
Pacific ocean perch	34.84	56.87	0.12	3.40	0.29	18.23	35.22	53.02
Rougheye rockfish	<0.01	<0.01	1.87	51.02	0.91	57.46	2.78	4.18
Shortraker rockfish	0.00	0.00	0.67	18.37	0.18	11.05	0.85	1.28
Shortspine thornyhead	0.98	1.60	0.00	0.00	0.00	0.00	0.98	1.47
Yelloweye rockfish	0.00	0.00	0.12	3.40	0.00	0.00	0.12	0.18
Other rockfish*	0.01	0.02	0.01	0.34	0.01	0.55	0.03	0.05
Total	61.26		3.66		1.59		66.51	
Percent by area	92.11		5.50		2.39			

* Species included in the category are listed in Table 44.

Table 46.--Common and scientific names of flatfish identified in the 1986 foreign and joint venture catches in the Gulf of Alaska region.

Common name	Scientific name
Alaska plaice	*Pleuronectes quadrituberculatus*
Arrowtooth flounder (turbot)	*Atheresthes stomias*
Butter sole	*Isopsetta isolepis*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Flathead sole	*Hippoglossoides elassodon*
Greenland turbot	*Reinhardtius hippoglossoides*
Hybrid sole	*Inopsetta ischyra*
Kamchatka flounder	*Atheresthes evermanni*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Rock sole	*Lepidopsetta bilineata*
Sand sole	*Psettichthys melanostictus*
Starry flounder	*Platichthys stellatus*
Yellowfin sole	*Limanda aspera*

Table 47.--Estimated catch of flatfish by species and area in the Gulf of Alaska during 1986.

Common name	Shumagin t	Shumagin %	Chirikof t	Chirikof %	Kodiak t	Kodiak %	Total t	Total %
Foreign directed fisheries								
Arrowtooth flounder	41.72	74.97	13.88	93.28	--	--	55.60	78.83
Butter sole	0.00	0.00	0.04	0.26	--	--	0.04	0.06
English sole	0.00	0.00	<0.01	<0.01	--	--	<0.01	<0.01
Flathead sole	8.21	14.75	0.51	3.43	--	--	8.72	12.36
Greenland turbot	0.03	0.05	0.02	0.13	--	--	0.05	0.07
Kamchatka flounder	<0.01	<0.01	0.00	0.00	--	--	<0.01	<0.01
Petrale sole	0.10	0.18	0.00	0.00	--	--	0.10	0.14
Rex sole	0.52	0.94	0.00	0.00	--	--	0.52	0.74
Rock sole	3.37	6.06	0.43	2.90	--	--	3.80	5.39
Yellowfin sole	1.70	3.05	0.00	0.00	--	--	1.70	2.41
Total	55.65		14.88		--		70.53	
Percent by area	78.90		21.10		--			
Joint venture fisheries								
Alaska plaice	0.00	0.00	0.00	0.00	4.04	0.68	4.04	0.42
Arrowtooth flounder	231.72	76.78	30.30	45.99	252.30	42.51	514.32	53.51
Butter sole	0.00	0.00	6.19	9.39	80.71	13.60	86.90	9.04
Dover sole	0.02	0.01	0.05	0.07	22.67	3.82	22.74	2.37
English sole	0.00	0.00	0.01	0.02	2.61	0.44	2.62	0.27
Flathead sole	13.52	4.48	8.61	13.07	37.51	6.32	59.64	6.21
Greenland turbot	0.31	0.10	0.03	0.05	0.01	<0.01	0.35	0.04
Hybrid sole	0.00	0.00	0.00	0.00	4.98	0.84	4.98	0.52
Kamchatka flounder	0.08	0.03	0.00	0.00	0.00	0.00	0.08	0.01
Petrale sole	0.00	0.00	<0.01	<0.01	1.31	0.22	1.31	0.14
Rex sole	31.97	10.59	0.01	0.02	9.08	1.53	41.06	4.27
Rock sole	22.09	7.32	20.64	31.31	169.45	28.55	212.18	22.08
Sand sole	0.00	0.00	0.00	0.00	0.59	0.10	0.59	0.06
Starry flounder	0.00	0.00	0.05	0.07	7.30	1.23	7.35	0.76
Yellowfin sole	2.08	0.69	0.00	0.00	0.89	0.15	2.97	0.31
Total	301.79		65.89		593.45		961.13	
Percent by area	31.41		6.83		61.76			

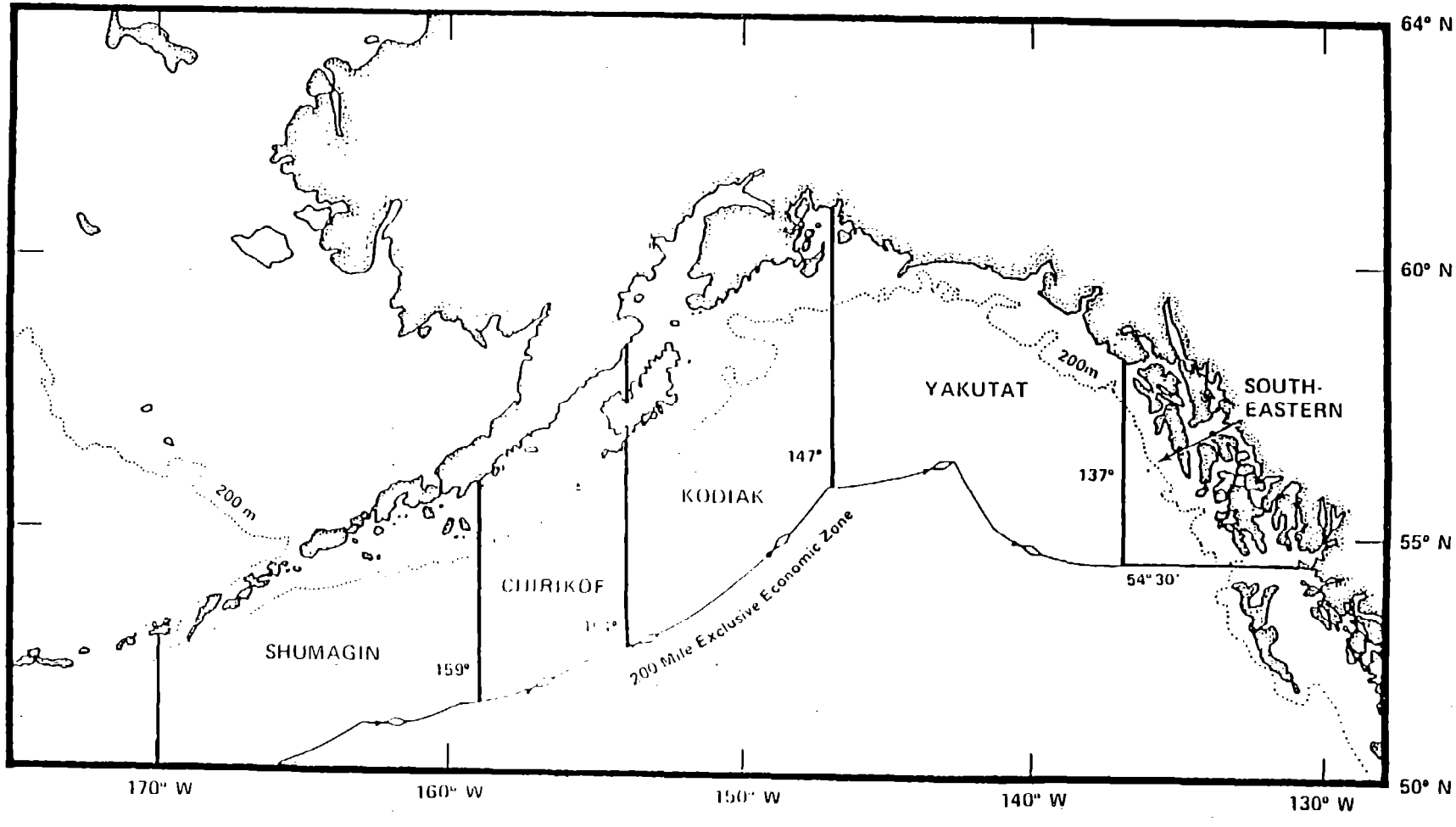
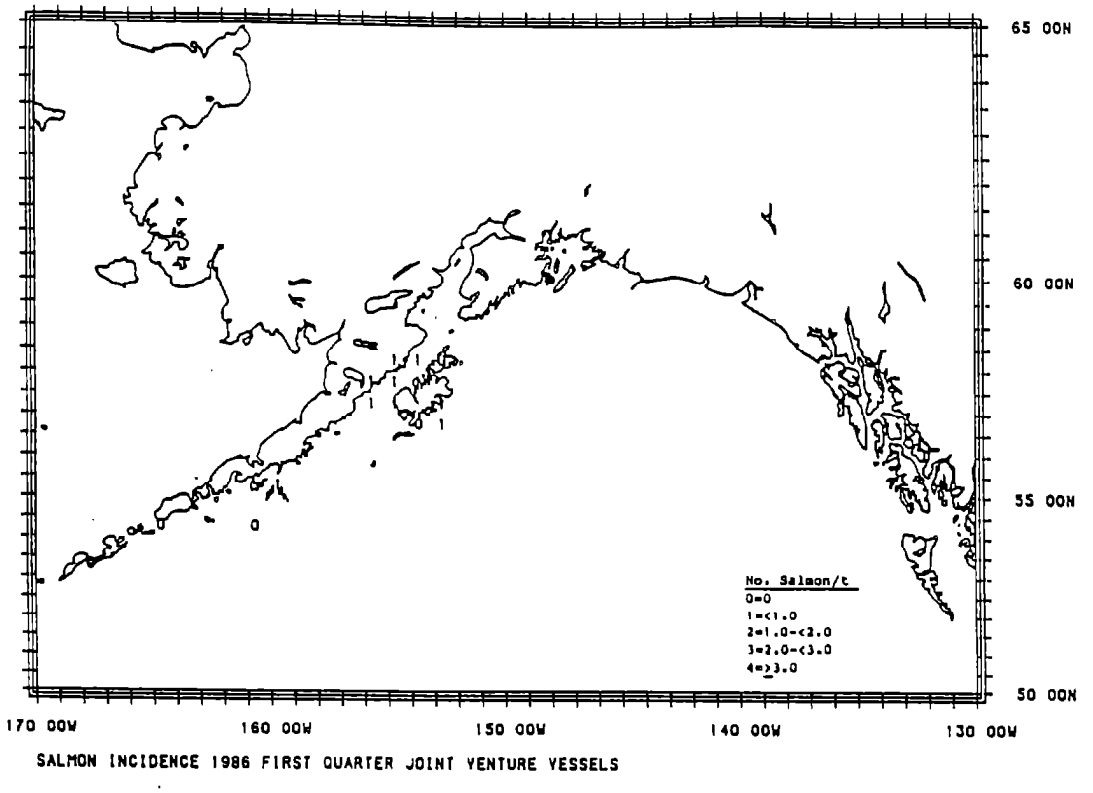
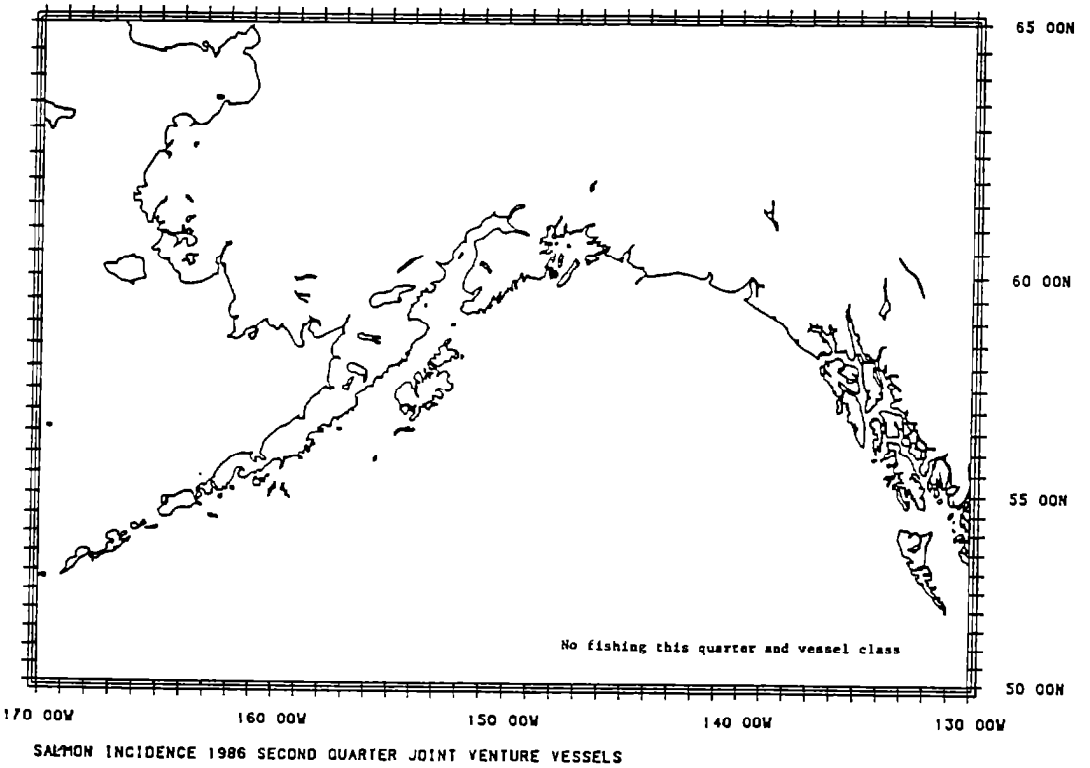


Figure 18.--U.S. statistical areas in the Gulf of Alaska region used to summarize catch and effort data.

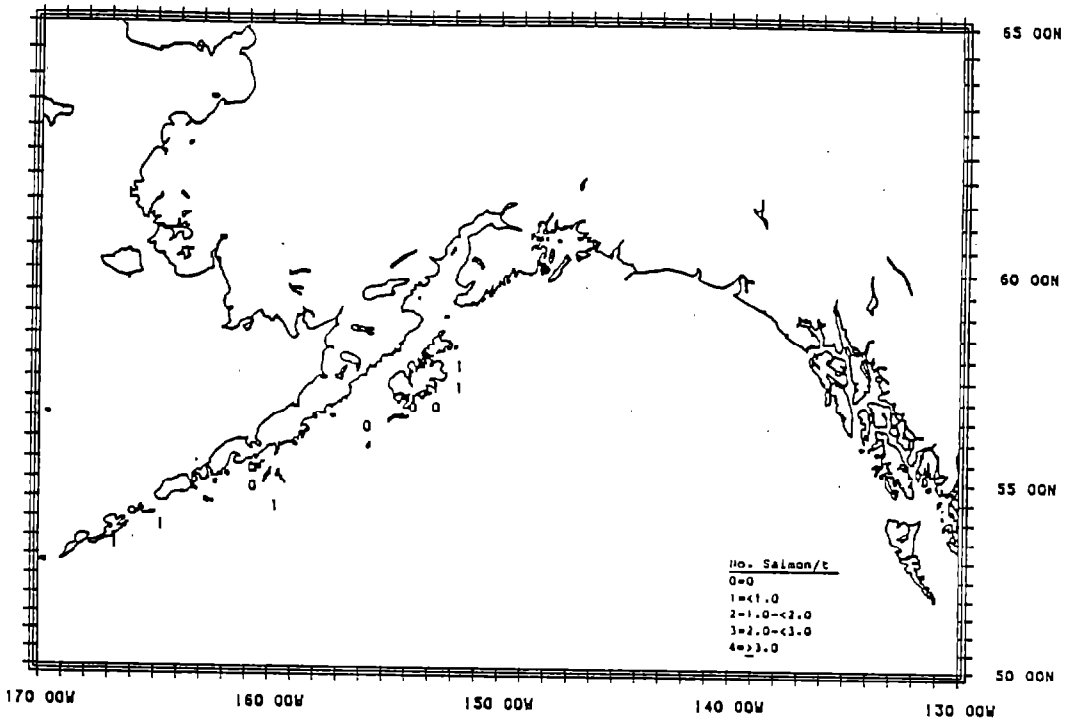


SALMON INCIDENCE 1986 FIRST QUARTER JOINT VENTURE VESSELS

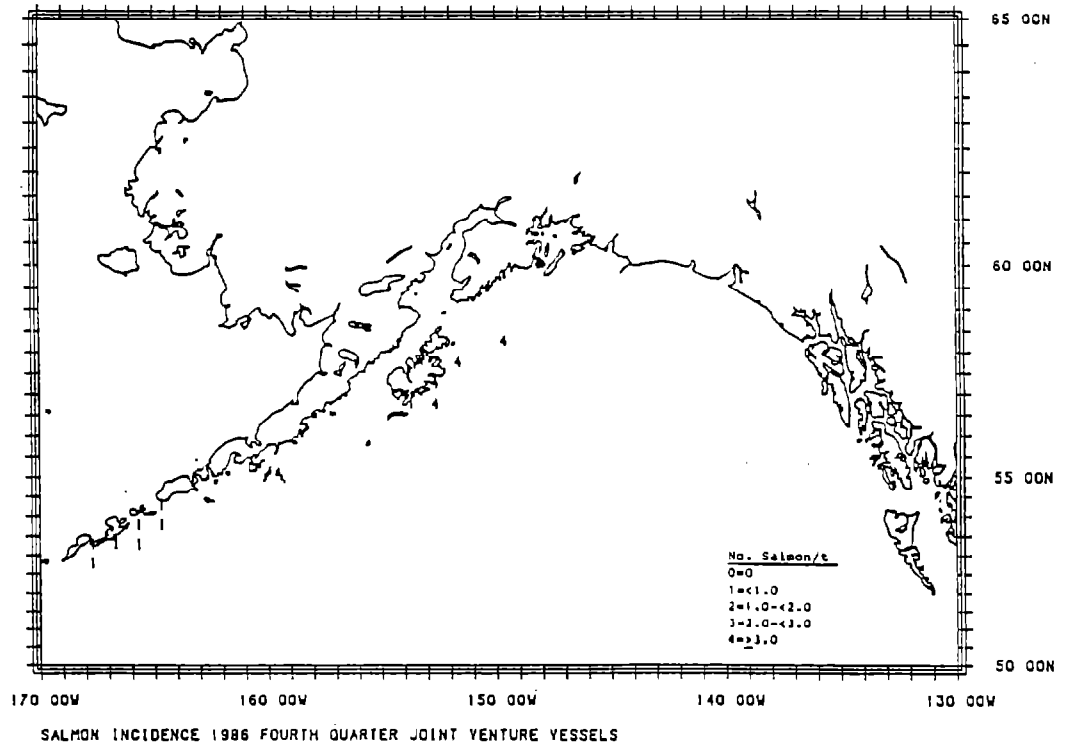


SALMON INCIDENCE 1986 SECOND QUARTER JOINT VENTURE VESSELS

Figure 19.--Average incidence (no./t) of salmon in the joint venture fisheries by quarter and l/2° lat. by l° long. areas, 1986.

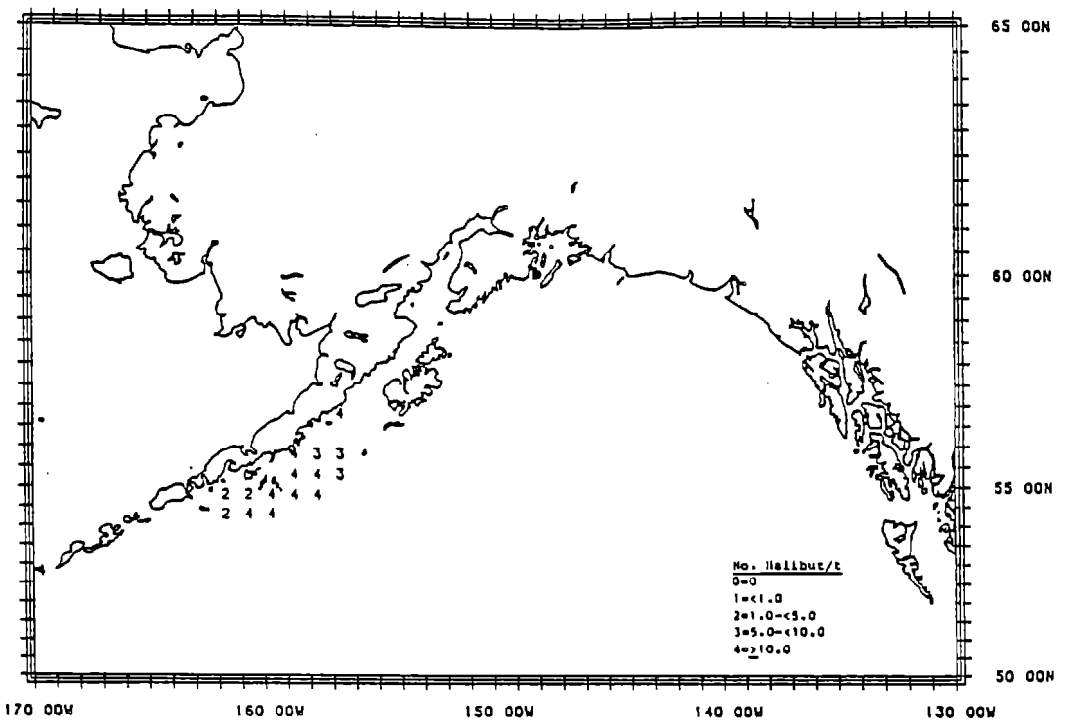


SALMON INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS

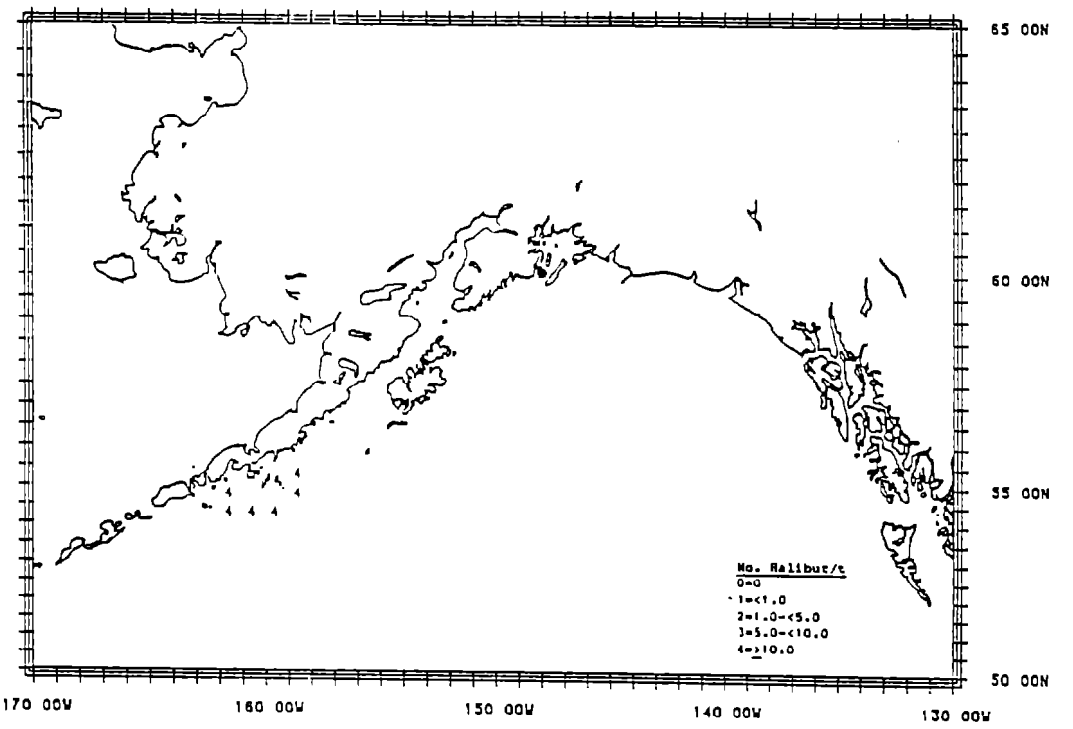


SALMON INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 19. --Continued.

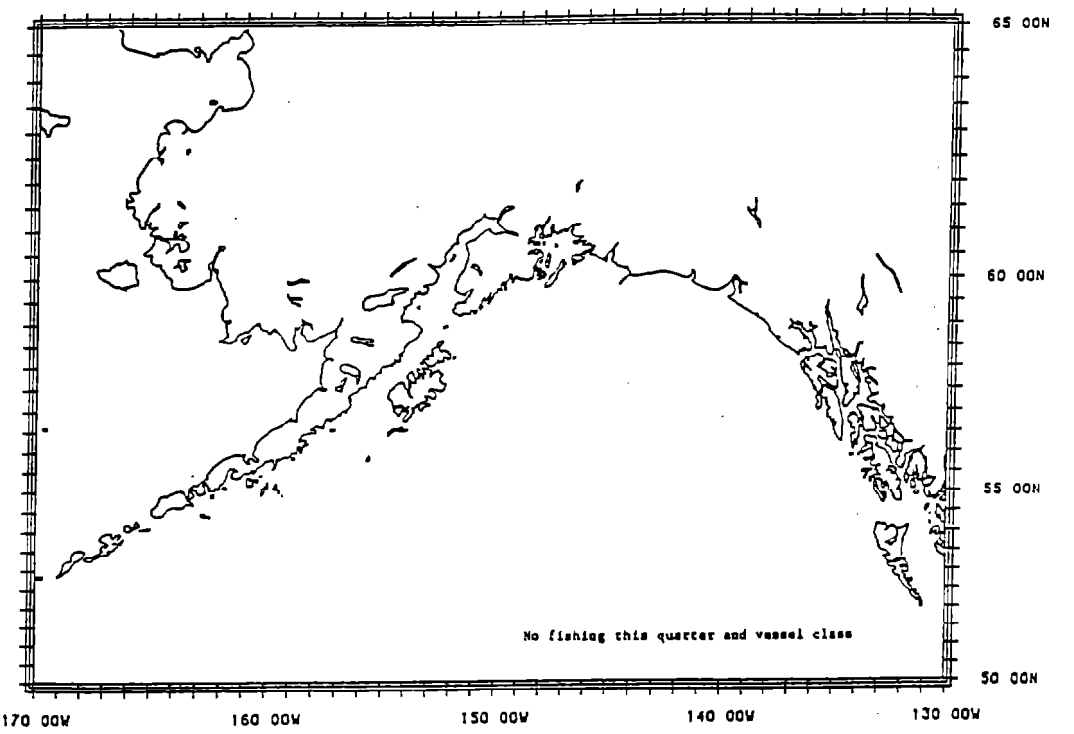


HALIBUT INCIDENCE 1986 FIRST QUARTER LONGLINE VESSELS

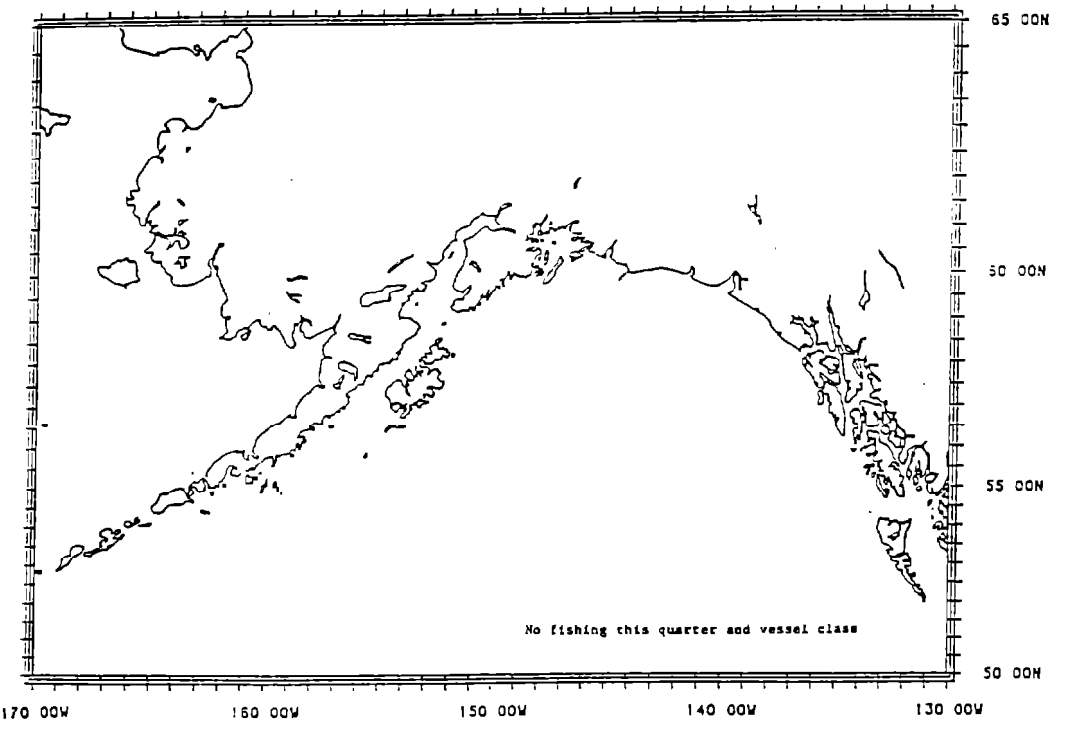


HALIBUT INCIDENCE 1986 SECOND QUARTER LONGLINE VESSELS

Figure 20. --Average incidence (no./t) of Pacific halibut on longline vessels by quarter and l/2° lat. by 1° long. areas, 1986.

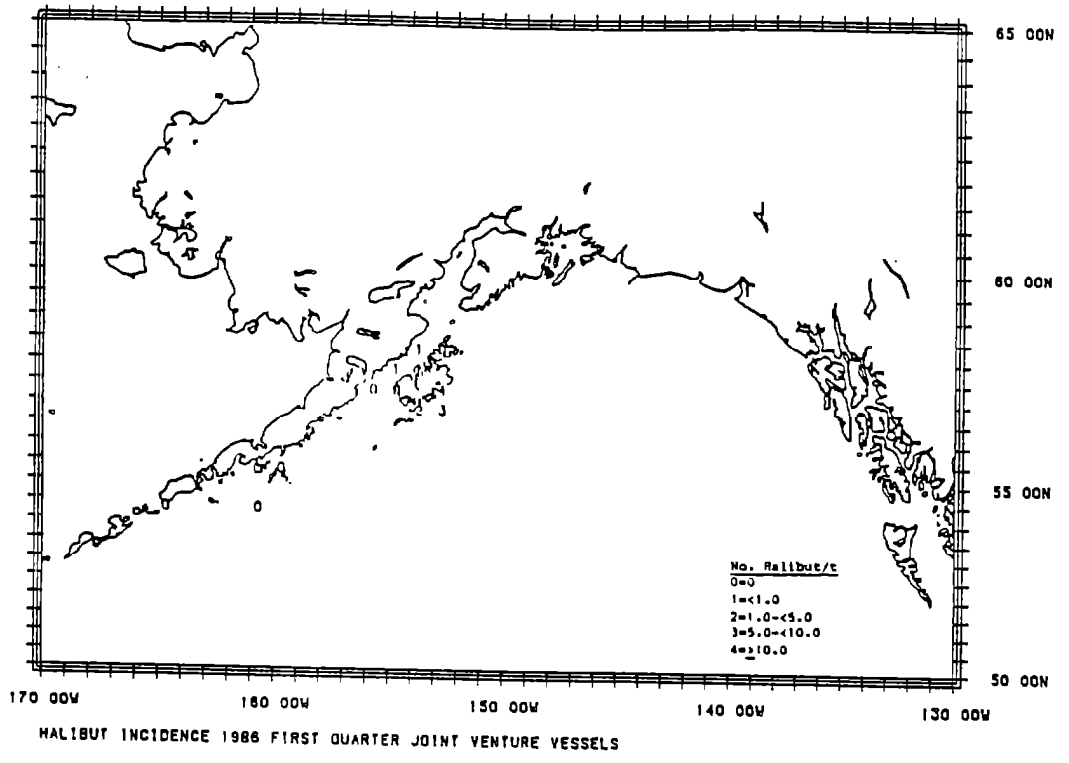


HALIBUT INCIDENCE 1986 THIRD QUARTER LONGLINE VESSELS



HALIBUT INCIDENCE 1986 FOURTH QUARTER LONGLINE VESSELS

Figure 20.--Continued.



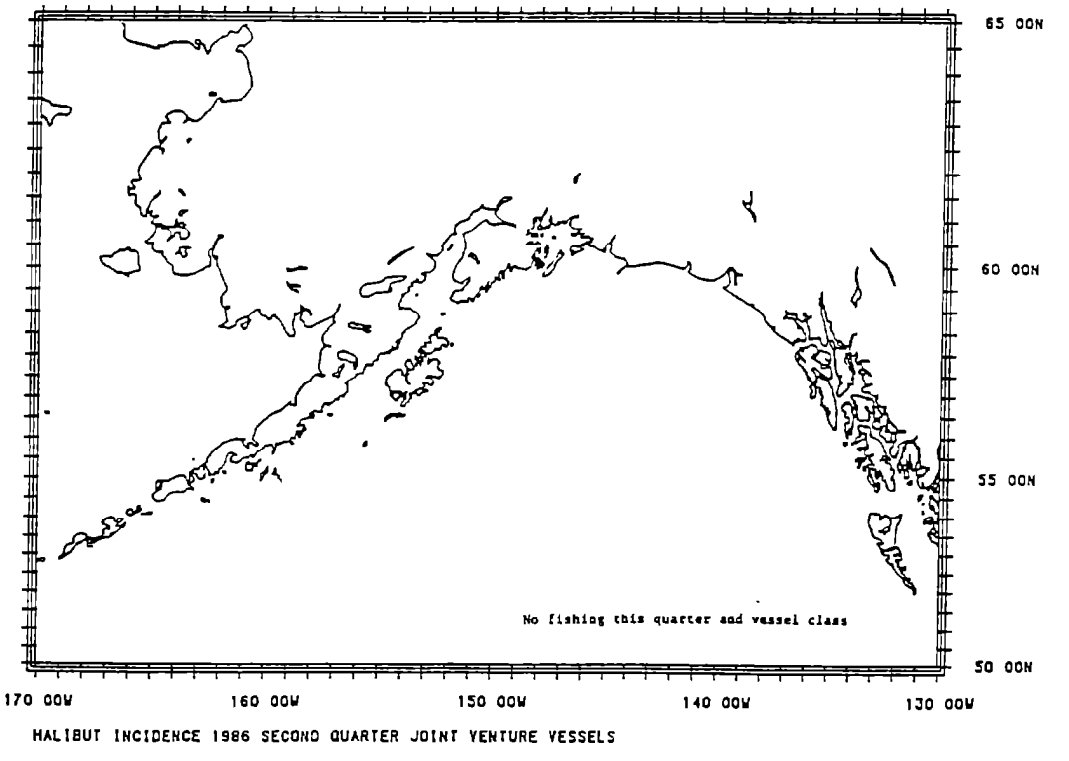
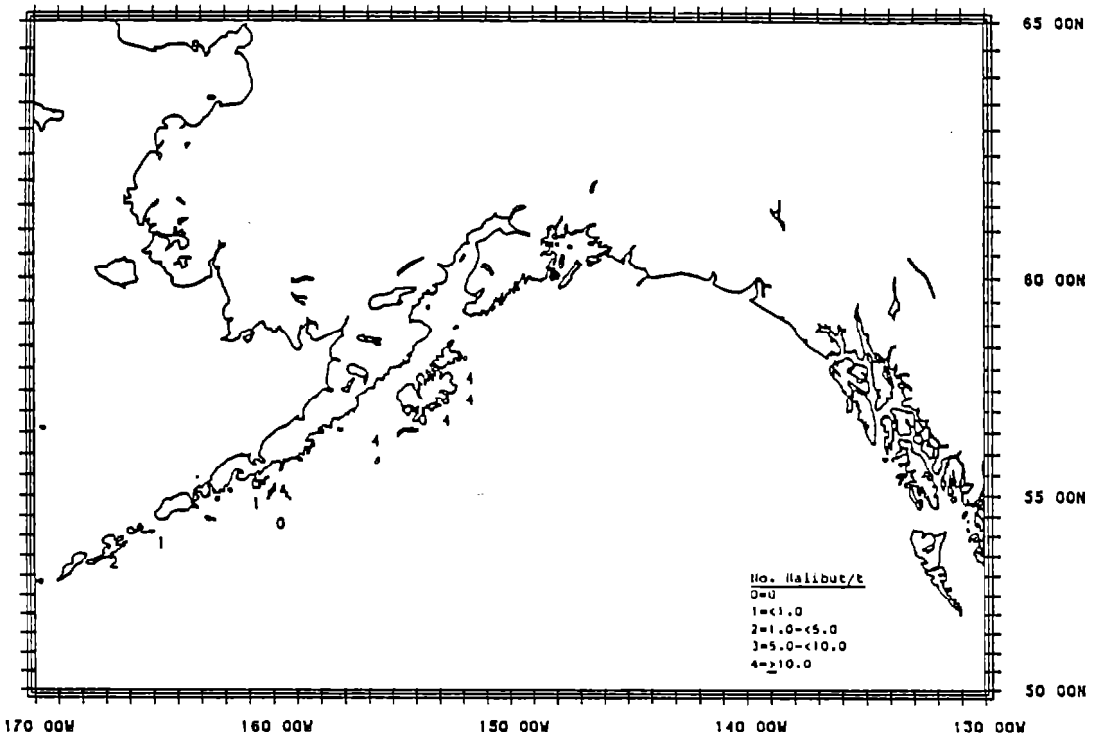
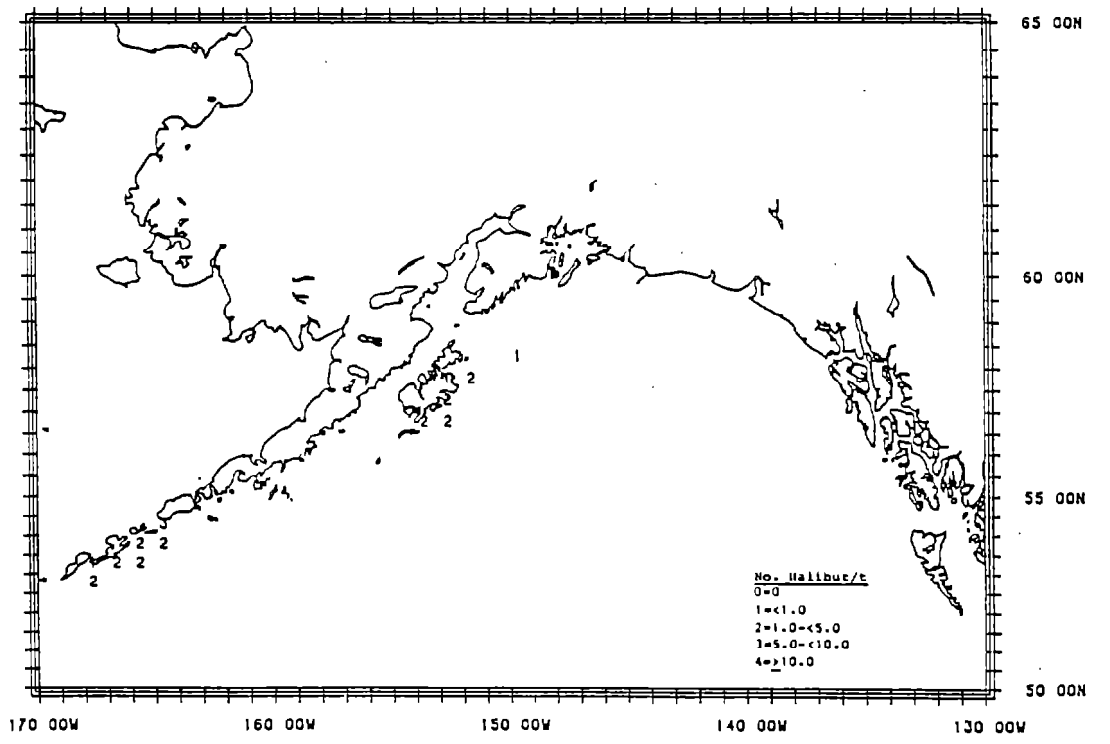


Figure 21 .--Average incidence (no-/t) of Pacific halibut in the joint venture fisheries by quarter and 1/2° lat. by 1 long. areas, 1986.

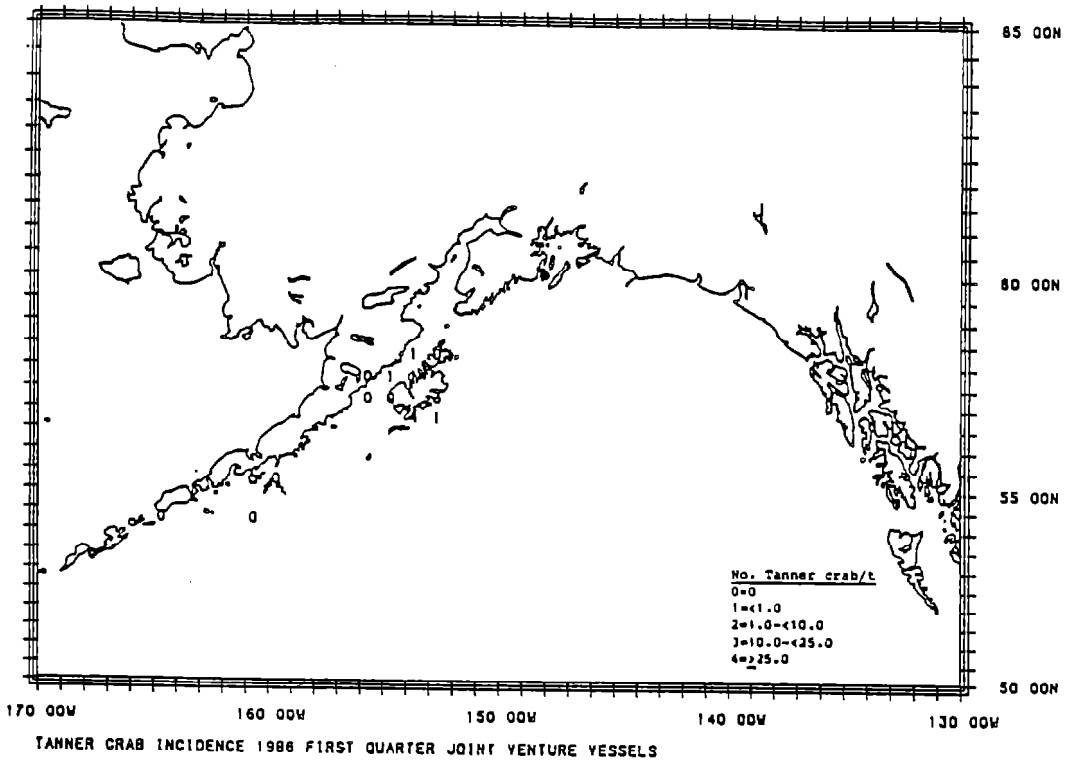


HALIBUT INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS



HALIBUT INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 21 . --Continued .



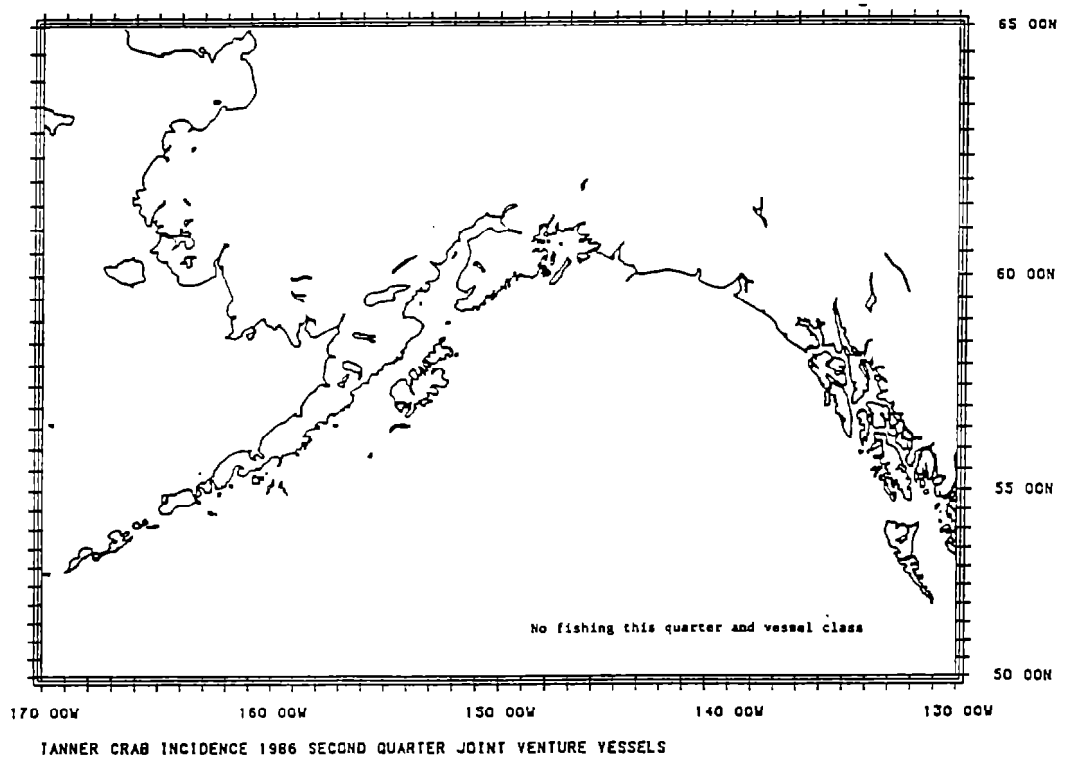
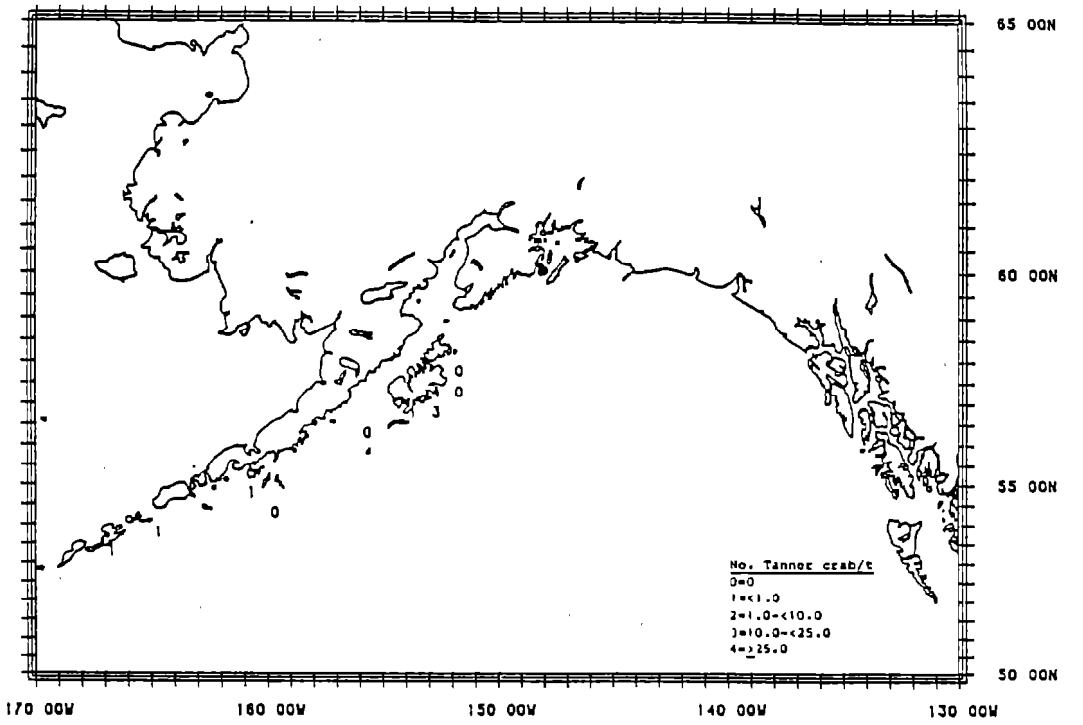
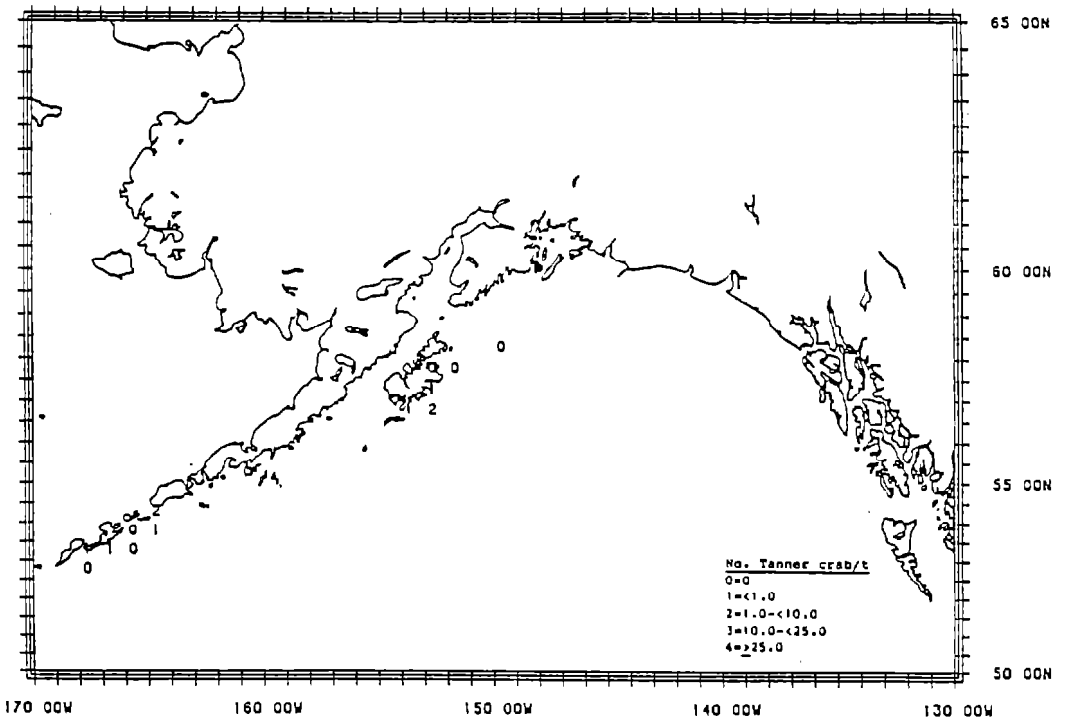


Figure 22. --Average incidence (no./t) of Tanner crab in the joint venture fisheries by quarter and l/2° lat by 1° long. areas, 1986.



TANNER CRAB INCIDENCE 1986 THIRD QUARTER JOINT VENTURE VESSELS



TANNER CRAB INCIDENCE 1986 FOURTH QUARTER JOINT VENTURE VESSELS

Figure 22. --Continued.

SUMMARY OF OBSERVER SAMPLING OFF THE COASTS OF WASHINGTON, OREGON, AND CALIFORNIA

Observer Coverage of Fishing Fleets

Joint venture fishing operations for Pacific whiting off the Washington-Oregon-California (WOC) coast (Fig. 23) in 1986 occurred between 1 May and 22 October, and were conducted by U.S. fishermen and processing vessels from Poland and the U.S.S.R. (See Table 1 for the definition of a joint venture mothership). Foreign fishing operations for Pacific whiting were performed by Polish large freezer trawlers from 1 June to 25 October. In the joint venture fishery, the observer sampling effort of 1,617 days accounted for 95.4% of the total joint venture vessel effort of 1,695 days expended in the WOC region in 1986 (Table 48). The level of coverage for the 1985 joint venture fishery was 92.7%. In the foreign fishery, observers sampled 1,419 days out of a possible 1,497 days (94.8%) in 1986. In 1985, observers sampled 95.5% of the foreign fishing days. The overall observer effort of 3,036 days provided an observer coverage of 95.1% of the entire Pacific whiting fishery.

Estimates of Foreign and U.S. Joint Venture Catches

Within the fisheries for Pacific whiting, the total allowable level of foreign fishing (quota) was set for Pacific whiting. Catches of other species were limited to a percentage of the Pacific whiting quota. The percentages assigned to these other species in 1986 were as follows:

Species	Percentage of Pacific whiting quota
Flounders	0.1
Jack mackerel (Trachurus symmetricus)	3.0
Pacific ocean perch	0.062
Rockfishes (excluding Pacific ocean perch)	0.738
Sablefish (Anoplopoma fimbria)	0.173
Other species	0.500

For the joint venture fishery, the above percentage limitations were placed on the retention of species other than Pacific whiting and were applied to each 5,000 t of Pacific whiting received in the EEZ from U.S. vessels. If the retention limit of a species was reached prior to the foreign nations' receipt of 5,000 t of Pacific whiting, additional catches of that species were required to be discarded until 5,000 t of Pacific whiting were received and an additional 5,000 t allocation of Pacific whiting was authorized. The percentage limitation on retention of a species applied to each succeeding 5,000 t of Pacific whiting received. The reason for retention limits was the desire by U.S. fishery managers to maintain some control over the by-catch of other important commercial groundfish species taken in the Pacific whiting joint venture.

Approximately 153,600 t of groundfish were landed in 1986 in the foreign and joint venture Pacific whiting fishery (Table 49). About 151,500 t (98.6%)

of the catch was Pacific whiting. Polish vessels fishing on a foreign allocation harvested 69,900 t of whiting, and the joint venture fisheries landed 81,600 t of whiting. The total catch of Pacific whiting by the foreign fishery in 1986 was 40.1% larger than that of 1985; the catch by joint venture fisheries in 1986 was 158% larger than the catch of Pacific whiting made in 1985 (Berger et al. 1987). Since the implementation of the MFCMA in 1977, the annual catch of Pacific whiting by the foreign fishery had decreased from 127,000 t in 1977 to no catch at all in 1983 (Table 50). In 1984, foreign fishing resumed, and in 1985 it once again exceeded the joint venture catch. In 1986, it increased in size again, but the joint venture fishery greatly increased its take of Pacific whiting and exceeded the foreign catch. In the foreign fishery, jack mackerel, the rockfish group (excluding Pacific ocean perch), and the species complex classified as "other fish" composed the highest portions of catch other than Pacific whiting. In the joint venture, the secondary species were the group of rockfish and the "other fish" complex. The majority of the by-catch taken in the joint venture fishery was discarded from the processing vessels.

Incidence and Incidental Catch of Prohibited Species

Pacific Salmon and Steelhead

The incidence and average weights of salmon taken in the Pacific whiting fishery in 1986 are shown in Table 51 by nation, statistical area, and month. The highest incidence of salmon occurred in the U.S. -U.S.S.R. joint venture in the Eureka area where the incidence of salmon averaged 12.842 fish/t 'in August and 0.936 fish/t in July. One other monthly incidence rate exceeded 1.0 fish/t, that being in the U.S. -Poland joint venture in the Columbia area in July. Almost all of the monthly incidence rates in the joint venture fishery exceeded 0.1 fish/t. The foreign fishery had annual incidence rates of 0.193 salmon/t in the Columbia area,and 0.066 salmon/t in the Eureka area. The overall incidence (foreign and joint venture combined) of salmon in 1986 was 8.6 times higher than that observed in 1985 (0.242 fish/t vs. 0.028 fish/t).

Figure 24 provides a summary by 1/2° latitude and l° longitude blocks of the incidence of salmon in the 1986 Pacific whiting fishery. As in previous years, incidence rates were highest in two locations, in the northern California-southern Oregon area (40°30'-42°30'N lat.) and off the Olympic Peninsula (47°00'-47°30'N lat.). In 1986, however, the incidence rates along the entire coast were several times greater than the rates observed in the past.

The total estimated incidental catch of salmon in the Pacific whiting fishery in 1986 was 43,800 fish or 72.7 t (Table 52). This was a substantially higher salmon by-catch than for any other year since the inception of the MFCMA in 1977 (Table 53). In 1984, 88% of the incidental salmon catch occurred during July and August in the Vancouver and Columbia areas. In 1985, this percentage was 62%. In 1986, the salmon by-catch came from several areas and time periods. Thirty-six percent of the salmon were still taken during July and August in the Vancouver and Columbia areas (14,706 salmon caught in joint venture operations and 1,178 salmon caught in the foreign trawl fishery); 26% of the salmon were landed in September and October in the Columbia area (3,026 salmon taken by the joint ventures and 8,474

salmon landed in the foreign trawl fishery); 24% of the salmon by-catch occurred in the Eureka area in July (9,413 salmon landed by joint venture fishing and 1,022 salmon caught in the foreign trawl fishery).

In the foreign fishery, four species of salmon were caught. Chinook salmon composed 75.9% of the incidental catch and had an average fork length of 53.5 cm (Table 54). Coho salmon averaging 55.6 cm in fork length accounted. for 23.5% of the catch. Chum salmon (56.3 cm average length) made up 0.6% of the catch, and sockeye salmon (0.04%) accounted for the remainder. In the joint venture fishery, four species of salmon also occurred. Chinook salmon made up 94.1% of the incidental catch and had an average fork length of 47.7 cm. Coho salmon averaged 52.8 cm and accounted for 3.75% of the incidental salmon catch. The remaining incidental salmon catch was composed of chum salmon (2.1%) and sockeye salmon (0.03%).

A single female steelhead was caught by a Polish large freezer trawler in July in the Eureka area. The steelhead weighed 0.96 kg and had a length of 44 cm. This was the only steelhead seen by observers in 1986.

Pacific Halibut

As in previous years, the incidence of halibut in the 1986 Pacific whiting fishery was extremely low. The annual incidence of halibut in the Vancouver area was 0.002 fish/t (Table 55). In the Columbia area, the incidence rate was 0.001 fish/t. In the Eureka area, the incidence rate ranged from 0 fish/t to 0.009 fish/t. The total estimated incidental catch of halibut in 1986 was 116 fish, or 0.7 t (Table 56).

Rockfish Catch by Species

Observers identified 29 species of rockfish in catches landed in the foreign and joint venture Pacific whiting fisheries in 1986 (Table 57). The catch of yellowtail rockfish (Sebastes flavidus) composed 59.5% of the overall rockfish catch and catches of widow rockfish (S. entomelas) composed 27% of the rockfish catch (Table 58). Yellowtail rockfish was the dominant rockfish species caught in the Vancouver and Columbia areas. Black rockfish (S. melanops) was the primary rockfish species caught in the Eureka area. Chili-pepper (S. goodei) accounted for 98.5% of the small rockfish catch in the Monterey area.

In 1986, a total of about 988 t of rockfish were taken by the foreign and joint venture fisheries targeting on Pacific whiting in the Washington-Oregon-California region (Table 58). (This total includes catches of rockfish retained and discarded in the joint venture fishery.) Most of the rockfish catch (86.5%) occurred in the Columbia area, 12.7% were netted in the Vancouver area, 0.7% were caught in the Eureka area, and 0.1% were taken in the Monterey area.

Flatfish Catch by Species

The catch of 18 different species of flatfish (Table 59) accounted for 6.82 t in the Pacific whiting fishery (Table 60). Five percent of the total flatfish catch occurred in the Vancouver area, 90% in the Columbia area, and 5% in the Eureka area. There was no flatfish catch reported from the Monterey area. The primary species of flatfish identified in the catch were Pacific sanddab (Citharichthys sordidus) (43.1%), arrowtooth flounder (22.7%), rex sole (22.6%), and Dover sole (Microstomus pacificus) (5.4%).

Table 48.--Annual summary of observer effort, joint venture effort, and observer coverage (observer days x l00/foreign vessel days) by nation and vessel class in the foreign and joint venture fisheries off Washington, Oregon, and California, 1986.

Nation	Vessel class	No. of observers	No. of ships observed	No. of ships in fishery	No. of observer days	No. of vessel days	Percent coverage
Poland	Large freezer trawler	39	26	26	1,419	1,497	94.8
U.S.-Poland	Joint venture	22	16	16	718	747	96.1
U.S.-U.S.S.R.	Joint venture	17	8	8	899	948	94.8
TOTAL		65[a]	37[b]	37[b]	3,036	3,192	95.1

[a] This column does not add up because several observers sampled on more than one vessel type.

[b] Thirteen Polish vessels participated in both the directed and joint venture fisheries and were, therefore, only counted once within the total.

Table 49.--Estimated catches of groundfish taken by foreign and joint venture vessels operating in the Pacific whiting fishery off Washington, Oregon, and California, 1986.

Species group	Poland[a]		Joint venture fishery[b]				All fisheries
	Catch (t)	Whiting quota (%)	Retained (t)	Discarded (t)	Total (t)	Whiting catch (%)	Total (t)
Pacific whiting	69,861.0	--	81,639.5	--	81,639.5	--	151,500.5
Jack mackerel	549.3	0.79	0.4	42.2	42.6	0.05	591.9
Rockfish (excluding Pacific ocean perch)	193.5	0.28	164.9	608.5	773.4	0.95	966.9
Pacific ocean perch	1.4	<0.01	0.0	19.5	19.5	0.02	20.9
Sablefish	7.4	0.01	5.9	15.6	21.5	0.03	28.9
Flounders	1.8	<0.01	0.1	4.9	5.0	0.01	6.8
Other fish	138.4	0.20	43.9	281.8	325.7	0.40	464.1
TOTAL	70,752.8		81,854.7	972.5	82,827.2		153,580.0

[a] The Pacific whiting quota in 1986 was 70,000 t. for Poland. See text description of by-catch levels in relation to the Pacific whiting quota.

[b] See text for description of regulations pertaining to retention and discarding of joint venture catch.

Table 50.--Estimated catch of Pacific whiting by foreign and joint venture fisheries off Washington, Oregon, and California, 1977-86[a].

Fishery	1977 t	1978 t	1979 t	1980 t	1981 t	1982 t	1983 t	1984 t	1985 t	1986 t
Foreign	127,013	93,332	114,910	44,023	70,365	7,089	NF	14,772	49,853	69,861
Joint venture	NF	856	8,834	27,537	43,557	67,465	72,100	78,889	31,692	81,640
TOTAL	127,013	94,188	123,744	71,560	113,922	74,554	72,100	93,661	81,545	151,501

[a] Estimates for years 1977-85 are from Berger et al. 1987.

NF = No fishing

Table 51 .--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture (JV) groundfish catches on the Pacific Coast, 1986. Lines indicate areas not fished.

	Vancouver		Columbia		Eureka		Monterey	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.098	2.971	0.006	6.002	--	--
July	--	--	0.348	1.661	0.067	2.980	--	--
Aug.	--	--	0.056	1.792	0.146	2.938	--	--
Sep.	--	--	0.326	2.004	--	--	--	--
Oct.	--	--	0.204	2.377	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	0.193	2.129	0.066	3.037	--	--
U.S.-U.S.S.R JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	NS	NS	--	--	--	--
May	--	--	0.147	1.793	--	--	--	--
June	0.064	1.716	0.103	1.982	--	--	--	--
July	0.304	1.627	0.541	1.475	0.936	1.501	--	--
Aug.	--	--	0.076	2.155	12.842	0.751	0.193	3.926
Sep.	NS	NS	0.342	1.727	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.192	1.641	0.168	1.748	2.904	0.952	0.193	3.926

NS = Fishing occurred but no sampling by U.S. observers.

Table 51 .--Incidence (number per metric ton of catch) and average weight (kg) of salmon taken in the foreign and joint venture (JV) groundfish catches on the Pacific Coast, 1986 (Continued). Lines indicate areas not fished.

	Vancouver		Columbia		Eureka		Monterey	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Poland JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	0.247	1.501	--	--	--	--
June	0.366	1.613	0.148	1.605	--	--	--	--
July	0.781	1.373	1.184	1.307	--	--	--	--
Aug.	0.532	1.661	0.195	1.784	--	--	--	--
Sep.	0.305	1.996	0.216	1.634	--	--	--	--
Oct.	--	--	0.317	2.183	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.499	1.594	0.399	1.510	--	--	--	--

Table 52.-Estimated incidental catch of salmon (numbers and tons) in the foreign and joint venture Pacific whiting fisheries off Washington, Oregon, and California, 1986.

Month	Vancouver*		Columbia		Eureka		Monterey		All areas	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t	Nos.	t
Foreign fishery--Poland										
June	--	--	179	0.5	45	0.3	--	--	224	0.8
July	--	--	942	1.6	1,103	3.3	--	--	2,045	4.9
August	--	--	704	1.3	684	2.0	--	--	1,388	3.3
September	--	--	3,786	7.6	0	0.0	--	--	3,786	7.6
October	--	--	2,735	6.5	0	0.0	--	--	2,735	6.5
TOTAL	--	--	8,346	17.5	1,832	5.6	--	--	10,178	23.1
Joint venture fishery--U.S.-Poland										
May	--	--	313	0.5	--	--	--	--	313	0.5
June	651	1.1	662	1.1	--	--	--	--	1,313	2.2
July	1,766	2.4	6,836	8.9	--	--	--	--	8,602	11.3
August	1,313	2.2	1,430	2.6	--	--	--	--	2,743	4.8
September	497	1.0	987	1.6	--	--	--	--	1,484	2.6
October	--	--	1,310	2.9	--	--	--	--	1,310	2.9
TOTAL	4,227	6.7	11,538	17.6	--	--	--	--	15,765	24.3
Joint venture fishery--U.S.-U.S.S.R.										
April	--	--	52	0.1	--	--	--	--	52	0.1
May	--	--	1,572	2.8	--	--	--	--	1,572	2.8
June	103	0.2	1,172	2.3	--	--	--	--	1,275	2.5
July	573	0.9	3,260	4.8	3,035	4.6	--	--	6,868	10.3
August	--	--	736	1.6	--	--	18	0.1	754	1.7
September	17	<0.1	696	1.2	--	--	--	--	713	1.2
TOTAL	693	1.1	7,488	12.8	3,035	4.6	18	0.1	11,234	18.6
All fisheries--TOTAL										
April	--	--	52	0.1	--	--	--	--	52	0.1
May	--	--	1,885	3.3	--	--	--	--	1,885	3.3
June	754	1.3	2,013	3.9	45	0.3	--	--	2,812	5.5
July	2,339	3.3	11,038	15.3	4,138	7.9	--	--	17,515	26.5
August	1,313	2.2	2,870	5.5	684	2.0	18	0.1	4,885	9.8
September	514	1.0	5,469	10.4	0	0.0	--	--	5,983	11.4
October	--	--	4,045	9.4	0	0.0	--	--	4,045	9.4
TOTAL	4,920	7.8	27,372	47.9	4,867	10.2	18	0.1	37,177	66.0

* The foreign fishery is prohibited from fishing in the Vancouver area.

Table 53.--Estimated catch of salmon (numbers) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, 1977-86[a].

	Foreign fishery				Joint venture fishery					Grand total
Area/year	Total Nos.	USSR Nos.	Poland Nos.	Bulgaria Nos.	Total Nos.	US-USSR Nos.	US-Poland Nos.	US-Bulgaria Nos.	US-Greece Nos.	All fisheries
Vancouver[b]										
1977										
1978										
1979										
1980					356	356				356
1981					752	752				752
1982					3,144	2,465		679		3,144
1983					2,235	2,235				2,235
1984					3,702	2,546	1,156			3,702
1985					555	239	316			555
1986					4,920	693	4,227			4,920
Columbia										
1977	11,896	10,727	1,169							11,896
1978	5,236	2,534	2,702		19	19				5,255
1979	6,361	5,860	501		1,623	1,623				7,984
1980	4,815		4,815		1,382	1,370	12			6,197
1981	2,357		2,289	68	444	373	0	71		2,801
1982	102			102	2,434	2,036		398		2,536
1983					2,221	2,221				2,221
1984	52	16	36		5,966	4,661	1,305			6,018
1985	687		687		1,020	389	631			1,707
1986	8,346		8,346		19,026	7,488	11,538			27,372
Eureka										
1977	2,731	2,461	270							2,731
1978	669	347	322							669
1979	682	529	153							682
1980	16		16		1,864	1,853	11			1,880
1981	2,704		2,545	150	5,226	4,844	295	67	20	7,930
1982	2			2	6,116	5,996		120		6,118
1983					612	612				612
1984	11	11			523	523				534
1985	26		26							26
1986	1,832		1,832		3,035	3,035				4,867
Monterey										
1977	0	0	0							0
1978	0	0	0							0
1979										
1980										
1981	0		0							0
1982					0	0				0
1983					75	75				75
1984					1	1				1
1985										
1986					18	18				18
TOTAL										
1977	14,627	13,088	1,439							14,627
1978	5,905	2,881	3,024		19	19				5,924
1979	7,043	6,389	654		1,623	1,623				8,666
1980	4,831		4,831		3,602	3,579	23			8,433
1981	5,052		4,834	218	6,422	5,969	295	138	20	11,474
1982	104			104	11,694	10,497		1,197		11,798
1983					5,143	5,143				5,143
1984	63	27	36		10,192	7,731	2,461			10,255
1985	713		713		1,575	628	947			2,288
1986	10,178		10,178		26,999	11,234	15,765			37,177

[a] Estimated catches for years 1977-85 from Berger et al. 1987.

[b] The foreign fishery is prohibited from fishing in the Vancouver area.

Table 54.--Biological data on the incidental catch of Pacific salmon in the foreign and joint venture groundfish fishery off Washington, Oregon, and California, 1986.

Species	Percent by species	Sex	Sex composition	Average weight (kg)	Average length (cm)
Foreign directed fisheries					
Chinook	75.89	Male	45.65	2.27	53.0
		Female	48.32	2.26	53.5
		Unsexed	6.03	2.46	56.9
		Combined		2.28	53.5
Chum	0.60	Male	31.75	3.36	59.2
		Female	63.52	2.24	53.7
		Unsexed	4.73	4.00	70.0
		Combined		2.68	56.3
Coho	23.46	Male	49.08	2.18	54.7
		Female	49.19	2.37	56.0
		Unsexed	1.73	2.81	68.3
		Combined		2.29	55.6
Sockeye	0.04	Male	0.00	--	--
		Female	100.00	2.41	56.9
		Unsexed	0.00	--	--
		Combined		2.41	56.9
Joint venture fisheries					
Chinook	94.13	Male	49.69	1.54	47.4
		Female	44.98	1.61	48.4
		Unsexed	5.33	1.26	44.6
		Combined		1.56	47.7
Chum	2.09	Male	56.51	2.82	63.4
		Female	19.01	3.49	64.6
		Unsexed	24.48	1.56	43.9
		Combined		2.64	58.9
Coho	3.75	Male	56.03	1.77	52.0
		Female	40.67	2.04	54.1
		Unsexed	3.30	1.56	49.6
		Combined		1.87	52.8
Sockeye	0.03	Male	40.13	3.93	67.8
		Female	59.87	1.51	54.4
		Unsexed	0.00	--	--
		Combined		2.48	59.8

Table 55.--Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture (JV) groundfish catches on the Pacific Coast, 1986. Lines indicate areas not fished.

	Vancouver		Columbia		Eureka		Monterey	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
Polish Large Freezer Trawler								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	0.003	6.672	0.000	0.000	--	--
July	--	--	0.002	6.794	0.000	0.000	--	--
Aug.	--	--	<0.001	3.700	0.000	0.000	--	--
Sep.	--	--	0.001	4.378	--	--	--	--
Oct.	--	--	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	--	--	<0.001	5.586	0.000	0.000	--	--
U.S.-U.S.S.R JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	NS	NS	--	--	--	--
May	--	--	0.001	6.486	--	--	--	--
June	0.000	0.000	<0.001	0.500	--	--	--	--
July	0.004	2.360	0.001	4.071	0.009	0.635	--	--
Aug.	--	--	0.000	1.772	0.009	1.448	0.000	0.000
Sep.	NS	NS	0.004	5.078	--	--	--	--
Oct.	--	--	--	--	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.002	2.360	0.001	5.151	0.009	0.778	0.000	0.000

NS = Fishing occurred but no sampling by U.S. observers.

Table 55. --Incidence (number per metric ton of catch) and average weight (kg) of Pacific halibut taken in the foreign and joint venture (JV) groundfish catches on the Pacific Coast, 1986 (Continued). Lines indicate areas not fished.

	Vancouver		Columbia		Eureka		Monterey	
	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight	Incidence	Average weight
U.S.-Poland JV Mothership								
Jan.	--	--	--	--	--	--	--	--
Feb.	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	0.000	0.000	--	--	--	--
June	0.001	3.000	0.000	0.000	--	--	--	--
July	0.000	0.000	0.001	5.474	--	--	--	--
Aug.	0.003	5.497	0.001	5.450	--	--	--	--
Sep.	0.003	9.469	0.001	5.649	--	--	--	--
Oct.	--	--	0.000	0.000	--	--	--	--
Nov.	--	--	--	--	--	--	--	--
Dec.	--	--	--	--	--	--	--	--
Annual	0.002	6.617	0.001	5.497	--	--	--	--

Table 56.--Estimated incidental catch of Pacific halibut (numbers and tons) in the foreign and joint venture Pacific whiting fishery off Washington, Oregon, and California, **1986***.

Month	Vancouver		Columbia		Eureka		Total	
	Nos.	t	Nos.	t	Nos.	t	Nos.	t
Foreign fishery--Poland								
June	--	--	6	<0.1	0	0.0	6	<0.1
July	--	--	6	<0.1	0	0.0	6	<0.1
August	--	--	1	<0.1	0	0.0	1	<0.1
September	--	--	7	<0.1	--	--	7	<0.1
October	--	--	0	0.0	--	--	0	0.0
TOTAL	--	--	20	0.1	0	0.0	20	0.1
Joint venture fishery--U.S.-Poland								
May	--	--	0	0.0	--	--	0	0.0
June	1	<0.1	0	0.0	--	--	1	<0.1
July	0	0.0	8	<0.1	--	--	8	<0.1
August	8	0.1	5	<0.1	--	--	13	0.1
September	5	<0.1	3	<0.1	--	--	8	0.1
October	--	--	0	0.0	--	--	0	0.0
TOTAL	14	0.1	16	0.1	--	--	30	0.2
Joint venture fishery--U.S.-U.S.S.R.								
April	--	--	0	0.0	--	--	0	0.0
May	--	--	15	0.1	--	--	15	0.1
June	0	0.0	1	<0.1	--	--	1	<0.1
July	7	<0.1	7	<0.1	28	<0.1	42	0.1
August	--	--	3	<0.1	--	--	3	<0.1
September	0	0.0	7	<0.1	--	--	7	<0.1
TOTAL	7	<0.1	33	0.2	28	<0.1	68	0.2
All fisheries--TOTAL								
April	--	--	0	0.0	--	--	0	0.0
May	--	--	15	0.1	--	--	15	0.1
June	1	<0.1	7	<0.1	0	0.0	8	<0.1
July	7	<0.1	21	0.1	28	<0.1	56	0.2
August	8	0.1	9	<0.1	0	0.0	17	0.1
September	5	<0.1	17	0.1	--	--	22	0.1
October	--	--	0	0.0	--	--	0	0.0
TOTAL	21	0.1	69	0.4	28	<0.1	118	0.5

* No halibut were caught in the Monterey area.

Table 57.--The common and scientific names of rockfish identified in the 1986 foreign and joint venture catches in the Washington, Oregon, and California region.

Common name[a]	Scientific name
Black rockfish	Sebastes melanops
Bocaccio	Sebastes paucispinis
Canary rockfish	Sebastes pinniger
Chilipepper	Sebastes goodei
Darkblotched rockfish	Sebastes crameri
Pacific ocean perch	Sebastes alutus
Redstripe rockfish	Sebastes proriger
Rougheye rockfish	Sebastes aleutianus
Shortbelly rockfish	Sebastes jordani
Shortspine thornyhead	Sebastolobus alascanus
Splitnose rockfish	Sebastes diploproa
Widow rockfish	Sebastes entomelas
Yellowmouth rockfish	Sebastes reedi
Yellowtail rockfish	Sebastes flavidus
Other rockfish[b]	
Aurora rockfish	Sebastes aurora
Bank rockfish	Sebastes rufus
Blackgill rockfish	Sebastes melanostomus
Blue rockfish	Sebastes mystinus
Copper rockfish	Sebastes caurinus
Dusky rockfish	Sebastes ciliatus
Greenstriped rockfish	Sebastes elongatus
Pygmy rockfish	Sebastes wilsoni
Redbanded rockfish	Sebastes babcocki
Sharpchin rockfish	Sebastes zacentrus
Shortraker rockfish	Sebastes borealis
Silvergray rockfish	Sebastes brevispinis
Stipedtail rockfish	Sebastes saxicola
Vermilion rockfish	Sebastes miniatus
Yelloweye rockfish	Sebastes ruberrimus

[a] With all rockfish, the possibility of misidentification exists, and the listing of species not previously reported from the Washington-Oregon-California region should be noted with caution.

[b] The 15 species listed under "Other rockfish" each made up less than 0.10% of the rockfish catch by foreign vessels.

Table 58.--Estimated catch of rockfish by species and area in the Washington, Oregon, and California region during 1986.

Common name	Vancouver t	Vancouver %	Columbia t	Columbia %	Eureka t	Eureka %	Monterey t	Monterey %	Total t	Total %
Foreign directed fisheries										
Black rockfish	--	--	1.50	0.78	0.00	0.00	--	--	1.50	0.77
Bocaccio	--	--	0.77	0.40	0.06	4.32	--	--	0.83	0.43
Canary rockfish	--	--	1.28	0.66	0.07	5.04	--	--	1.35	0.69
Chilipepper	--	--	0.25	0.13	0.02	1.44	--	--	0.27	0.14
Dark Blotched rockfish	--	--	4.75	2.45	0.01	0.72	--	--	4.76	2.44
Pacific ocean perch	--	--	1.39	0.72	0.02	1.44	--	--	1.41	0.72
Redstripe rockfish	--	--	3.02	1.56	0.00	0.00	--	--	3.02	1.55
Rougheye rockfish	--	--	1.26	0.65	0.00	0.00	--	--	1.26	0.65
Shortbelly rockfish	--	--	20.03	10.35	0.00	0.00	--	--	20.03	10.28
Shortspine thornyhead	--	--	0.66	0.34	0.00	0.00	--	--	0.66	0.34
Splitnose rockfish	--	--	2.11	1.09	0.01	0.72	--	--	2.12	1.09
Widow rockfish	--	--	69.66	35.99	1.12	80.58	--	--	70.78	36.31
Yellowmouth rockfish	--	--	6.24	3.22	0.00	0.00	--	--	6.24	3.20
Yellowtail rockfish	--	--	79.93	41.30	0.07	5.04	--	--	80.00	41.04
Other rockfish*	--	--	0.63	0.33	0.01	0.72	--	--	0.64	0.33
Total	--		193.53		1.39		--		194.92	
Percent by area	--		99.29		0.71		--			
Joint venture fisheries										
Black rockfish	0.51	0.41	52.38	7.92	3.93	76.02	0.00	0.00	56.82	7.17
Boccacio	0.29	0.23	3.83	0.58	<0.01	<0.01	0.02	1.46	4.14	0.52
Canary rockfish	1.45	1.16	2.25	0.34	0.03	0.58	0.00	0.00	3.73	0.47
Chilipepper	0.03	0.02	0.11	0.02	0.02	0.39	1.35	98.54	1.51	0.19
Dark blotched rockfish	0.08	0.06	1.67	0.25	0.00	0.00	0.00	0.00	1.75	0.22
Pacific ocean perch	0.86	0.69	18.65	2.82	0.00	0.00	0.00	0.00	19.51	2.46
Redstripe rockfish	0.44	0.35	0.52	0.08	<0.01	<0.01	0.00	0.00	0.96	0.12
Rougheye rockfish	<0.01	<0.01	0.10	0.02	0.00	0.00	0.00	0.00	0.10	0.01
Shortbelly rockfish	0.00	0.00	1.61	0.24	0.00	0.00	0.00	0.00	1.61	0.20
Shortspine thornyhead	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Splitnose rockfish	0.01	0.01	0.07	0.01	0.00	0.00	0.00	0.00	0.08	0.01
Widow rockfish	26.59	21.26	166.92	25.24	0.20	3.87	0.00	0.00	193.71	24.43
Yellowmouth rockfish	0.02	0.02	0.14	0.02	0.00	0.00	0.00	0.00	0.16	0.02
Yellowtail rockfish	94.65	75.68	412.40	62.36	0.98	18.96	0.00	0.00	508.03	64.07
Other rockfish*	0.14	0.11	0.65	0.10	0.01	0.19	0.00	0.00	0.80	0.10
Total	125.07		661.32		5.17		1.37		792.93	
Percent by area	15.77		83.40		0.65		0.17			

* Species included in the category are Listed in Table 57.

Table 59.--Common and scientific names of flatfish identified in the 1986 foreign and joint venture catches in the Washington, Oregon, and California region.

Common name	Scientific name
Arrowtooth flounder (turbot)	Atheresthes stomias
Butter sole	Isopsetta isolepis
Curlfin sole	Pleuronichthys decurrens
Dover sole	Microstomus pacificus
English sole	Parophrys vetulus
Flathead sole	Hippoglossoides elassodon
Greenland turbot	Reinhardtius hippoglossoides
Hybrid sole	Inopsetta ischyra
Longhead dab	Limanda proboscidea
Pacific sanddab	Citharichthys sordidus
Petrale sole	Eopsetta jordani
Rex sole	Glyptocephalus zachirus
Rock sole	Lepidopsetta bilineata
Sand sole	Psettichthys melanostictus
Sanddab unident.	Bothidae
Slender sole	Lyopsetta exilis
Starry flounder	Platichthys stellatus
Yellowfin sole	Limanda aspera

Table 60.- Estimated catch of flatfish by species and area in the Washington, Oregon, and California region during 1986.

Common name	Vancouver t	Vancouver %	Columbia t	Columbia %	Eureka t	Eureka %	Monterey t	Monterey %	Total t	Total %
Foreign directed fisheries										
Arrowtooth flounder	--	--	0.49	28.00	<0.01	<0.01	--	--	0.49	27.84
Curlfin sole	--	--	0.11	6.29	<0.01	<0.01	--	--	0.11	6.25
Dover sole	--	--	0.01	0.57	<0.01	<0.01	--	--	0.01	0.57
English sole	--	--	0.03	1.71	<0.01	<0.01	--	--	0.03	1.70
Flathead sole	--	--	0.02	1.14	<0.01	<0.01	--	--	0.02	1.14
Pacific sanddab	--	--	0.11	6.29	<0.01	<0.01	--	--	0.11	6.25
Petrale sole	--	--	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	<0.01
Rex sole	--	--	0.98	56.00	0.01	100.00	--	--	0.99	56.25
Sanddab - unident.	--	--	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	<0.01
Slender sole	--	--	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	<0.01
Starry flounder	--	--	<0.01	<0.01	<0.01	<0.01	--	--	<0.01	<0.01
Total	--		1.76		0.01		--		1.77	
Percent by area	--		99.43		0.57		--			
Joint-venture fisheries										
Arrowtooth flounder	0.24	66.67	0.82	18.94	0.00	0.00	0.00	0.00	1.06	21.20
Butter sole	<0.01	<0.01	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Curlfin sole	0.00	0.00	0.02	0.46	0.00	0.00	0.00	0.00	0.02	0.40
Dover sole	0.02	5.56	0.23	5.31	0.11	35.48	0.00	0.00	0.36	7.20
English sole	0.01	2.78	0.08	1.85	<0.01	<0.01	0.00	0.00	0.09	1.80
Flathead sole	<0.01	<0.01	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Greenland turbot	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Hybrid sole	<0.01	<0.01	0.00	0.00	0.00	0.00	0.00	0.00	<0.01	<0.01
Longhead dab	0.00	0.00	0.01	0.23	0.00	0.00	0.00	0.00	0.01	0.20
Pacific sanddab	0.05	13.89	2.64	60.97	0.14	45.16	0.00	0.00	2.83	56.60
Petrale sole	<0.01	<0.01	0.01	0.23	0.00	0.00	0.00	0.00	0.01	0.20
Rex sole	0.04	11.11	0.46	10.62	0.05	16.13	0.00	0.00	0.55	11.00
Rock sole	0.00	0.00	0.06	1.39	0.00	0.00	0.00	0.00	0.06	1.20
Sand sole	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Sanddab - unident.	0.00	0.00	0.00	0.00	<0.01	<0.01	0.00	0.00	<0.01	<0.01
Slender sole	<0.01	<0.01	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Starry flounder	0.00	0.00	0.00	0.00	0.01	3.23	0.00	0.00	0.01	0.20
Yellowfin sole	0.00	0.00	<0.01	<0.01	0.00	0.00	0.00	0.00	<0.01	<0.01
Total	0.37		4.36		0.32		0.00		5.05	
Percent by area	7.33		86.34		6.34		0.00			

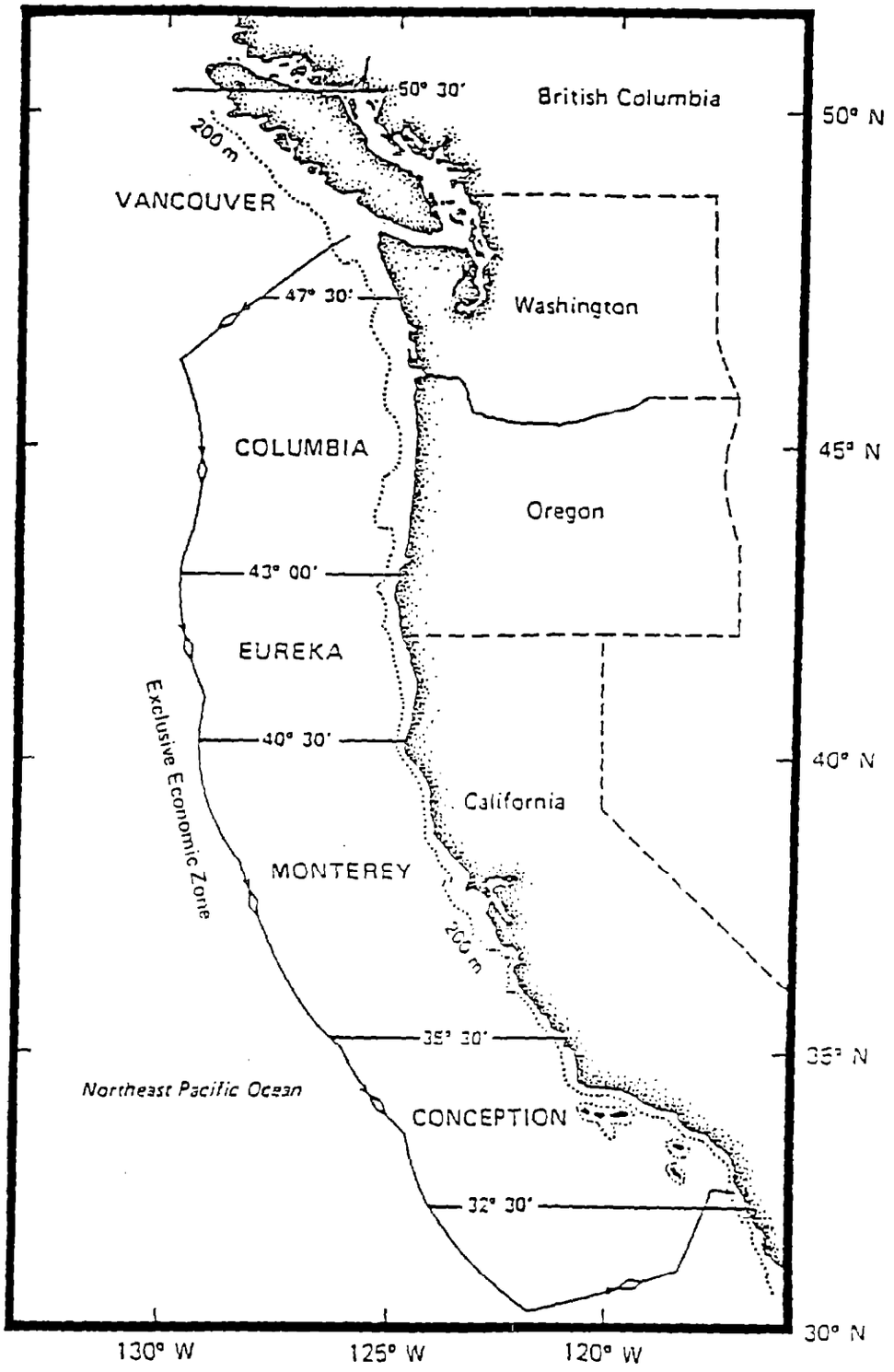


Figure 23.--U.S. statistical areas in the Washington-Oregon-California region used to summarize catch and effort data.

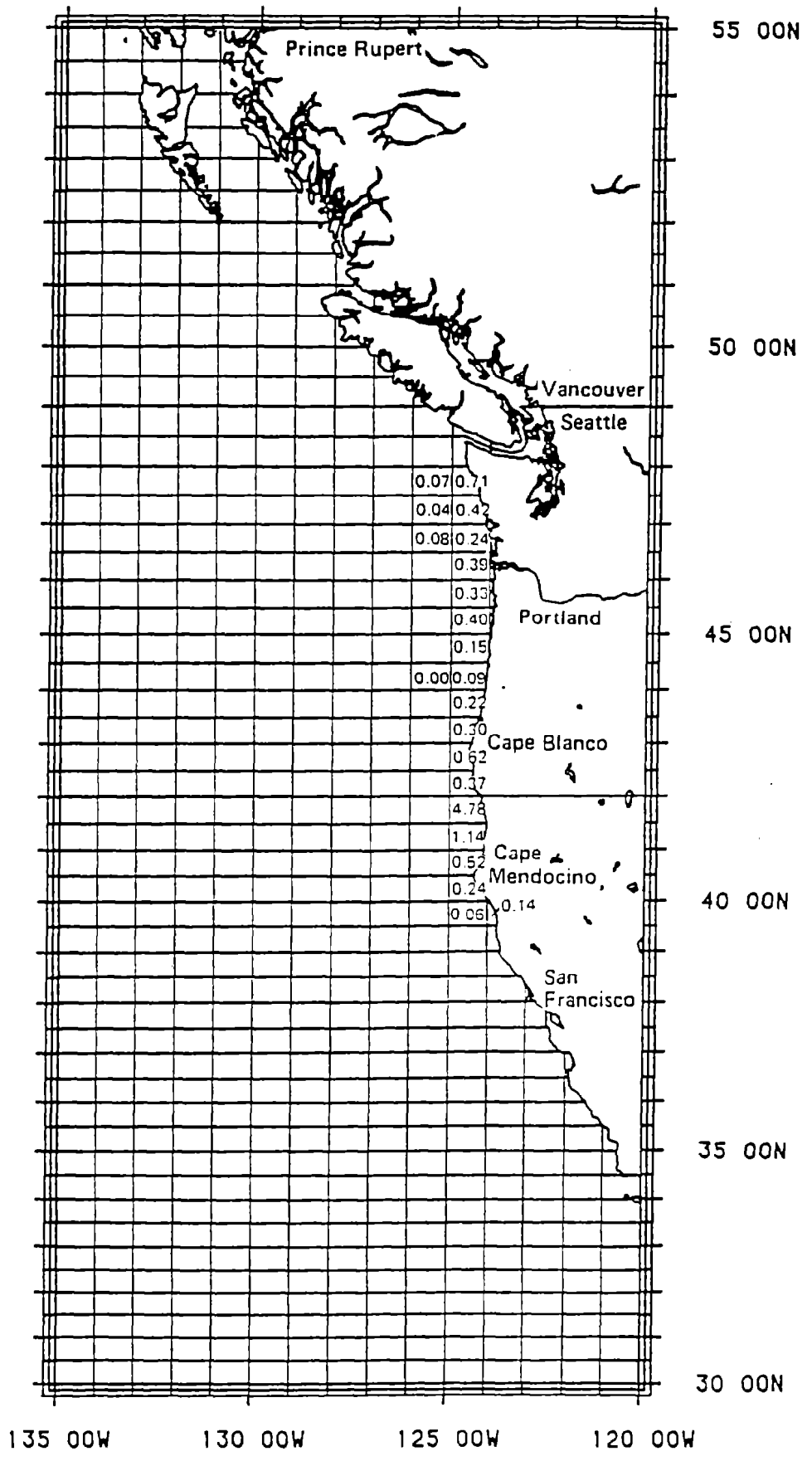


Figure 24.--Average incidence of salmon (no. of salmon/t of groundfish) in the joint venture Pacific whiting fishery off Washington, Oregon, and California, 1986.

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